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GAS LIGHTING,

WATER SUPPLY,

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EDITORIAL NOTES—GAS, &c.

Capital not Blameless.

ANY effort in any wise cause for furthering the interests of humanity, even if it does not command immediate sympathy, must claim the consideration of intelligent men; and we have yet to meet the intelligent man who will deny that one of the highest forms of work to which anyone can devote part of his time and energy is that—in these days when the evidence of necessity shown so forcibly—of doing a share in labouring for a solution of the thorny problem, the righting of the relations between employer and employed. It is an old subject; but it is one nevertheless that requires attack on a scale of persistence equal to the resistance, produced by antagonistic causes, which it offers to acceptable solution. Despite a life into which is pressed a full measure of activity and responsibility, Mr. Corbet Woodall has found time in which to do a substantial share in promoting a cause to which he had become an ardent and influential convert before the great protagonist of co-partnership in the gas industry—Sir George Livesey—was separated from the large and beneficent work that he accomplished among us. As this year's President of the Labour Co-partnership Association, Mr. Woodall on Thursday presided at the annual meeting, and then delivered an address that we hope will be seriously studied, in view of the incentives that it contains to (for the gas industry) fresh thought on the much-discussed question.

The subject is treated upon by him from a higher standpoint than the purely materialistic; but its purely materialistic side is also closely examined. We cannot overlook the latter in bringing the searchlight of intelligence to our aid in attempting to discover the causes that have produced the hostility that abounds between capital and labour; and the causes have to be discovered to enable the true remedies to be applied. The difficulties of the present are largely due to the errors of the past; and in this particular connection, the errors of the past have been, partly through selfishness, partly through the tenacity of convenient false doctrines, carried on from a state of comparatively simple business conditions in regard to manufacture and sale to those conditions that are, through vastness, of an indefinable complex order. This very complexity (which will not diminish, but will increase) is a good reason for every business man giving earnest and serious thought to one of the gravest weaknesses that exists in the industrial and commercial fabric. The worst flaw, Mr. Woodall tells us at greater length in his address, in the doctrines of the old school of economists (charging them thereby with shortsightedness) was in looking upon labour in the same light as raw material. Cheap labour, they held, was as essential as cheap raw material to cheap production. In other words, they gave no higher place in economical production to the human worker with an intelligence capable of cultivation in the interests of production than to the raw material that of itself could do nothing more than human ingenuity directed towards the consummation of the cheapest output. The human being can be developed into a highly productive medium in the cause of economy; the human being can also be developed into an automatic medium, doing no more than he is compelled to do, and as such he can be a wasteful element in the productive structure. To the short-sighted view in this matter of the old school of economists—to the setting, as Mr. Woodall puts it, of the rights of capital above those of humanity—must be ascribed a large part of the evil that has arisen from the growing antagonism of labour to capital. Capital, through original error, and a disregard of changing conditions, must take its share of the blame for the painfully evident want of cohesion to-day between its interests and those of labour. Labour, however, has asserted its right to a larger consideration in the economic problem; and capital cannot fail to recognize that labour is gaining its way by divers and devious routes. Are the routes chosen by labour unaided the right ones?

That is a question for capital to answer. The address before us contributes much thought to the framing of a reply. The cast-iron rule of what is called the "market value" for labour is faulty. In it there is no just recognition of the "respective and inherent rights" as between capital and labour. It does nothing for individual merit; there is no incentive in it for anything but compliance with narrow obligation. There is nothing in it that recognizes any right to participate in the gains produced by the amalgamation of the contribution of the capital in money of the proprietors and the capital in labour of those who are employed. As Lord Robert Cecil (himself a staunch supporter of the co-operative movement) said, in some remarks following the address, rates of wages must be settled in a measure by the law of supply and demand. But fortunately he does not stay there. The President, Lord Robert, Mr. Charles Carpenter, and all others who spoke, refuse to consider human beings as mere goods and chattels. Having brought a man into a business by employment at the wages settled by the law of supply and demand, or by what is more brutally called the "market "value" of the particular class of labour, something more is required. But what is that something? No greater practical ideal has yet been put forward than Co-partnership. It is not professed that the system establishes a perfect equilibrium between the rights of capital and labour; but until something better is produced, it stands at the head of all suggested solutions of a difficult problem. It co-partnership did nothing more than remove the hostility between capital and labour, it would justify itself. But it does something more. It gives every individual an incentive—and the incentive grows—to the pursuit of the best interests of the business in which he is a partner.

Further, ask Mr. Carpenter, Mr. Shoubridge, or any officials of Gas Companies who have had a lengthened experience of the system as applied to gas undertakings, whether there is not another important influence to be credited to the system of co-partnership; and they will reply that there is the moral side, which, in any business depending for its success upon the personal attributes of character and conduct of the individual units composing its operative forces in all the ramifications of activity, is an asset, and a potential one, upon which no one can set any precise value. Co-partnership has been found to influence a sense of responsibility and of mutual interest, thrift, self-esteem, the desire for improved surroundings in home life, and for much else that makes the man. Its efficacy in these directions is not claimed to be universal among the men. But show us any other system that has done more good than co-partnership in these ways among employees, who are the better employees for what it has done for them, and overboard shall go advocacy of the system of co-partnersnip in favour of its better.

It was for this system of co-partnership that Mr. Corbet Woodall stood up as President of the Labour Co-partnership Association, and delivered his indictment of the system that has produced difficulty, trouble, and national waste through the mistaken conceptions of a past day, and through the erroneous persistent nursing by capitalists of those conceptions, because more convenient than any others. Men like Mr. Woodall and Mr. Carpenter—heads of large industrial concerns, who can stand up and charge capital with a share of the blame for the hostile conditions existing between it and labour—are worthy the highest honour on the part of the great mass of humanity who come under the designation of workers—workers for a wage or salary.

Coal Resources.

THE annual meeting of the Victorian Gas Managers' Association (the first part of the report of the proceedings at which appeared in our columns last week) supplies another illustration of the great stress and strain that are brought on an industry whose main raw material is coal, by the perennial tumultuous conditions at the source of supply, and also a further illustration of the necessity for a greater preparedness for meeting trouble, which preparedness must include the question of extended resources. At the time the meeting was being held, the President of the Association (Mr. P. Holmes Hunt) had not reached home from his extended tour to study the latest technical and commercial gas developments in this and other countries; but the members are expecting (as they are sure to receive) much interest in the near future from the painstaking investigations of their President. That, however, by the way. The point as to coal resources was raised in a few remarks made by Mr. S. E. Figgis, who was the *locum tenens* of Mr. Hunt in the presidential chair. Australia has been through the turmoil, anxiety, and expense caused by a large and persistent coal strike; and, as in this country, the strike has had its lessons not only for those who have been engaged in it, but for the users of coal.

Large consumers of coal hardly know the full extent of their resources until necessity compels them to look into the subject. This is not good statesmanship. But it is the fact nevertheless that, during the time of comfortable conditions and normal deliveries, the past has seen really little concern displayed as to what would happen if there was an abrupt and prolonged cessation of coal supplies—through a national strike. Times change; and so do men's thoughts and their actions. We have had this brought home to us, and very acutely, in quite recent times in connection with labour by deliberate violation of agreements and disloyalty to national and trade union laws. The spread of the tenets of socialism among the workers of the country—among the miners not less than other sections of labour—and the encouragement of a more militant spirit, have induced this breaking through of the bounds of rule and government. In this is found ample reason for considering the subject of coal resources from a broader view in the present and the future than in the past. Those who have had the responsibility of the conduct of the gas undertakings of Australia during the recent strike, which Mr. Figgis describes as having been of "unprecedented severity" (and which description, we know, from the reports to hand from various quarters, is no exaggeration), have passed through an experience that will not readily sink into oblivion. Some of the smaller undertakings have good cause, too, for remembering with gratefulness the action of the Metropolitan Gas Company of Melbourne, who, to the extent of their ability, held out the neighbourly hand, containing material assistance, in the hour of dire need.

Troubles sometimes bring their recompense. To find out the weaknesses of a position tends to produce strength; and we may be sure of this, that trouble among the coal miners of Australia in the future will find the gas undertakings better prepared, by storage and by supplementary sources of supply, than in the past. One lesson of the strike is found in the demonstration that has been made that coal can be easily obtained for Australian use from India, Japan, and elsewhere. This having been proved, the position of the miners of Australia is to that extent weakened. In the struggles of labour for increased, and not always justifiable, advantages, there is a proneness to look more to the immediate gain than to the ultimate effects. When Northumberland and Durham raised their prices some time since to what was an exorbitant figure, their gas-works patrons down South showed their ability, on occasion, to draw their supplies from other parts of the country. The Gaslight and Coke Company have by trial proved their ability to feed their works with German coal, should the necessity arise, just as easily as the German Gas-Works have always drawn large supplies from this country. Troubles in our northern coal-fields, too, have, on more than one occasion, resulted in substantial Continental contracts that are annually looked for by the coal owners of this country being readily placed in the Westphalian coal-fields. Gas-works, too, have shown their ability to utilize, variably at will, oil as a raw material in place of coal—the normal use at the present time representing a displacement of coal to the amount of upwards of 2 million tons. Those responsible for the interruption of the continuity of coal supplies should take into account with greater fullness the fact that the strength of the strike as a weapon for producing compliance with their demands is weakened considerably by the compulsory forcing of buyers to give closer attention to the question of, and to expand their, resources. So far as the gas industry is concerned, the fact that illuminating quality *per se* in their prime commodity is to-day almost a negligible quantity has given to the administrators of undertakings the power to take a wider view than ever before of this important subject of raw material resources.

Gas in Railway Accidents.

THERE is now before us the report of Major Pringle, R.E., on the railway disaster at Hawes Junction on Christmas Eve; but we have only to consider the document here from one point of view—that is, as to the part (if any) that gas played in the painful scenes subsequent to the accident. There is a decided leaning in the report towards electric lighting; but, on the whole, the report is a far more reasonable one in relation to the gas lighting of railway trains than gas people had ventured to anticipate, having in view the somewhat notorious—made more notorious by the uses to which the vendors of electrical energy and appliances have put certain official views—predilection of one or two of the Board of Trade Railway Inspectors for electric lighting. It appears, however, from the present report that there has not been any specific ground for the attitude of the past, and certainly not for the screechings of the electrical press, nor for vulgar talk as to the roasting of human beings by gas-flames in railway accidents, nor for the attempt to use Major Pringle and his views as useful instruments to stir up public sentiment to further the commercial ends of the electrical industry. Major Pringle himself admits the absence of specific ground when he says, in the present report: "This is actually the first occasion when it can be "proved, beyond question of doubt, that fire was occasioned "by burning gas. It has to be remembered also that gas "has been in use for lighting purposes for a very long "period, and that during the whole of that time—in fact, "since the year 1868—there is no case of fire destroying "either the lives or bodies of passengers in railway acci-"dents." This being the case, the wild flights of imagination, and the attempted repeated vilification of gas in the manner that has been done by the rivals of the gas industry, using certain names and official capacities as a palladium, are, to say the least, contemptible.

On the present occasion, Major Pringle announces his preference for electric lighting. The preference is merely a personal matter. Nothing in the past—and the gas lighting of railway coaches has had a long past—has shown any undue risk attaching to the lighting by gas of railway carriages; but, on this occasion, the Inspector avows that "the fact is established that the fire originated in an escape "of gas from some of the cylinders carried under the "first two coaches." And, again, he says: "It cannot be "denied that compressed oil gas stored in the cylinders "under the two first coaches was the origin of the fire in "this case." Has Major Pringle considered the full import of the words "originated" and "origin"? This is not a mere quibble over words; but there are considerations attached to the question of "origin" which, if they show that gas did not originate but only added (we do not admit even now that it did the latter in view of Major Pringle's description of the damage to the gas cylinders and the connections) to the combustible material carried on the train, suggest at once that the proper course to be taken is to assure, and it can be done, that the storage of gas shall not contribute to fire, while retaining for railway trains the many "practical advantages" of which Major Pringle speaks in the sentence, "Gas, with the latest improvements in the way "of incandescent mantles, &c., has also many practical ad-"vantages over electricity as a source of illumination."

Stored gas cannot of itself be an originator of fire; the originator of fire with gas as the combustible is that which ignites the gas. We do not think that Major Pringle will be disposed to question this simple fact. But here is the weakest part of his whole report: He is unable to state how the gas carried under the coaches became ignited, if there was any to ignite. What he does say on this point is composed of theory and supposition. The fact, however, is abundantly clear from the report that the fire really started in the two coaches next to the engine, and that it

travelled along the train even to the third coach lighted electrically, which coach burned fiercely. It seems that the course of the origin of the fire points conclusively to this part of the catastrophe having had some connection with the engine. Mr. E. Bullock-Webster, Commissioner for the British Columbia Exhibition, supports this suggestion when, in his evidence, he says: "My own impression is that the "fire started from the engine. There was no light any-"where in the train so far as I am aware, except the fire "from the engine. I think there can be no doubt the col-"lision caused the fire in the engine to be thrown back "among the *débris* of splinters, cushions, and inflammable "material. I saw no sign of gas or flame of gas." The sleeping car attendant was also confident the fire which he saw started in the first coach close to the engine.

Most of the evidence accompanying the report indicates that witnesses only think, on reflection, that flames they saw during the excitement were fed by gas; and the really only definite evidence was by Engineer-Lieutenant H. B. M'Ghie, who said he saw two flames coming from gas-pipes under the second coach. He stopped one of them by stuffing up the end of the pipe with his glove; but he found the wood-work had not caught light there. In the other case, he could not get near enough to extinguish the burning flame. It appears to us Major Pringle himself somewhat discounts, while not reflecting upon their good faith, the evidence of this and other witnesses. Those pipes under the second coach from which the flames were said to be coming should surely be traceable. But there seems now to be a difficulty in locating them by an examination of the gas cylinders and their connections. The Inspector can only "suppose" the jets referred to issued from the low-pressure connections of the three cylinders under the second coach which were found unperforated; and he is clearly of the view that the gas-flames should have been longer than those described by Lieutenant M'Ghie. But what about the pipe, the end of which was stopped off with the glove? Was it a ¼-inch pipe? There is also Major Pringle's statement that the time occupied (in experiments) for gas to escape through a perforated cylinder and a ¼-inch diameter hole produced by the breaking away of the cylinders at the flange-plate from the high-pressure pipe—the gas having an initial pressure of 80 lbs.—was only 1¾ to 2 minutes. There was the evidence of the shepherd Ashton who lives in a cottage close by, who saw a bright flash before leaving his cottage. This flash Major Pringle says may have been caused by a large volume of escaping gas igniting; but this could not have lasted more than two or three minutes. Of course, one cannot have a sheet of gas-flame in the air, and the gas causing it to be burning under a coach at the same time. The same witness says he was awakened by the collision just before six; and he reached the scene of the accident just after six. "The two coaches in front of the train, so far as I "could judge, were in complete darkness. . . . I did "not see any smoke arising from the two coaches, and I do "not think the actual fire had started." The flame supposed to have been caused by the escaped gas was seen before that! Under all these circumstances, under all the contradictory evidence, it is difficult to agree with Major Pringle that "it is established that the fire *originated* in an escape "of gas;" or that "it cannot be denied that compressed gas "stored in the cylinders of the first two coaches was the "*origin* of the fire."

Apart from this, Major Pringle takes up a reasonable attitude when, in speaking of the "practical advantages" that incandescent gas lighting has over electricity—practical advantages summed up in the words that gas "requires no "expert staff, is nearly as easily controlled [as electricity], "is more economical to instal and maintain, and is less "liable to failure as an illuminant"—he says that before condemning gas it is reasonable to consider whether it is possible to safeguard its use by the adoption of means to minimize the risk of fire. He makes several suggestions, all showing that it is possible, if it is thought there is any risk in the present method of gas carriage and storage, of eliminating the risk, and so retaining the practical advantages of gas. Its economies in comparison with the heavy expense attaching to electricity, make the provision of the "safeguards" suggested by Major Pringle of comparatively small moment in regard to cost. And it may be hoped that the long and excellent experience with railway gas lighting will be continued, so as to modify his purely personal view that all the practical advantages of gas should be thrown overboard in order that uneconomical and unreliable electricity may be adopted. Let it be remembered that "gas "has been used for lighting purposes for a very long period; "and that during the whole of that time—in fact, since "1868—there is no case of fire destroying either the lives or "bodies of passengers in a railway accident." May we suggest that our electrical contemporaries will, in considering the report, notice all the points bearing upon the subject, and not the single one of Major Pringle's personal preference. It will be more just.

The Coalite Remnant.

Those responsible for the management of the Coalite concerns, it appears to us, prefer slow dissolution to sudden death. If this is so, the preference is a somewhat natural one, because the truth as to failure leaking out bit by bit will prepare the shareholders for facing what has long since appeared to be the inevitable. The plants at Plymouth, Hythe, and Wednesfield have gone the way of many other things that could not justify by success their right to continued existence. The plant at Barking, and the working and clerical staff have been reduced; and what remains at Barking to-day practically represents all that has corporeality as the result of the expenditure of the large capital that has been subscribed by the public either direct to the British Coalite Company, or through the parent concern, Coalite Limited. The unrepresented capital, whatever its amount, has gone beyond recall. The information as to the closing-down of plants to which we have referred appears in a circular letter, by the Managing Director of the British Coalite Company (Mr. Herman Clarke), that has been distributed with the accounts of Coalite Limited. One of the reasons ascribed by that gentleman for the shutting down of the plants was that, "with the exception of the Barking "plant, the works of the Company were located at points "where the local conditions made the manufacture of coalite "upon commercially profitable lines an impossibility." We ask Mr. Herman Clarke whether that is the real resaon for the closing-down of the coalite plant at Hythe; we ask him, too, to explain what is amiss with Plymouth that it should not be a suitable centre for coalite manufacture. If coalite could not be manufactured commercially at Plymouth (with the Gas Company taking the bye-product, gas), we fail to see where it can be so produced. But perhaps Mr. Clarke will describe, for the benefit of the shareholders and those technically interested, what are the geographical conditions that will ensure success, and whether Barking (where, so far as we are aware, there is no gas company taking the gas) fairly represents them.

Anyway, what Mr. Clarke says, and the results and the general position, are a reflection upon the wisdom of the administration of the past. There has been a long unbroken chain of error; and a magnificent display of credulity. We remember at this time the advertisements foreshadowing an inexhaustible golden wealth for those who put their trust and their money in coalite; we remember the magnificent display of platform oratory; we remember the ridicule cast upon our warnings and criticisms by exponents (untutored in carbonizing practices) of the virtues of low-temperature carbonization, when airing their views before the shareholders. We remember much else. There are promises even now of a net profit of 4s. per ton of coal carbonized by the Barking plant. Think of that plant and of the suggested profit in relation to the amount of money expended to date! In regard to Coalite Limited, the bulk of their assets appears to be in the shares of the British Coalite Company; and the Directors are still talking about the disposal of the foreign patents. What are the value of the shares in British Coalite to-day? and who is likely to buy the foreign patents after the experiences in this country? The shareholders of the British Coalite Company are still waiting the return of Sir William Preece from South Africa in order to learn (the other Directors seemingly will not make any disclosure in his absence) something of those wondertul negotiations that have been proceeding in his absence, and in conjunction with which the Directors are still announcing their anticipation of a favourable issue. At the moment, the outlook is black enough to make the most hardened critic of the operations that have brought the Coalite concerns to their present positions wish that something might happen to, partly at any rate, retrieve some of the loss the shareholders have incurred by yielding to the subtle seductions of the original prospectuses.

Gas Publicity Conference.

There is a point on which inquiry has been made with reference to the conference, next Monday afternoon, on the subject of the Gas Publicity Scheme. It is as to whether, in consideration of the interests of free discussion and free interrogation, to clear up doubtful points, the proceedings will be private. To satisfy those who are curious on the matter, it may be mentioned that we have been informed that it has been definitely resolved that the proceedings shall not be reported for publication in the Press, but merely for the purposes of the Publicity Committee, and that only such statement as is authorized by the Committee will be made in the Press. This being so, discussion and inquiry can be full and free. This is the last number of the "JOURNAL" that will be issued before the conference; and so we may remind readers that next Monday is the day, three o'clock the hour, and the place of assembly, the Institution of Mechanical Engineers, Storey's Gate, Westminster.

The Joint Meeting of Junior Associations.

As members of the Junior Associations are aware, there is to be a joint meeting this year in Birmingham; and the date has now been definitely fixed for Saturday, May 13. This timely intimation is given so that as many members as possible may be able to make arrangements to attend. Joint meetings of this character cannot, of course, be fixed up at very short intervals; and thus there is all the more reason for a good muster when they do take place. Birmingham is fairly central for the different Associations; and all who can go there may feel assured of the warmest of welcomes from their *confrères* in the Midlands. Time is not likely to hang heavily; for we learn from Mr. G. C. Pearson, the Hon. Secretary of the Midland Junior Association, that a comprehensive programme is being prepared to occupy the whole of the day. The proposal is to arrange for four parties each to visit an important manufacturing works in the district during the morning. Then after lunch at the Grand Hotel, four parties will be organized, each to visit one of the works of the Birmingham Corporation Gas Department. Tea at the Recreation Rooms of the Gas Department will be followed by visits to the new high-pressure laboratories (where there will doubtless be much of interest to be seen) and governor-houses in connection with the Birmingham Gas-Works. Finally, the members will meet together at the Trades Exhibition in the Bingley Hall, where there is an extensive show of gas lighting and gas appliances. The details of the programme with respect to the morning visits have not yet been completed; but, meanwhile, members of the Junior Associations may carefully note the date, with a view to being present at the meeting, which holds out every promise of being both enjoyable and instructive.

Coke-Oven Gas for Little Hulton.

Readers may probably recollect that the Little Hulton Urban District Council obtained an Act last season to enable them to purchase from the Salford Corporation the portion of the distributing plant within their district, and receive from the Earl of Ellesmere a supply of gas in bulk from the coke-ovens at Brackley, at a maximum price of 3s. 6d. per 1000 cubic feet. The Earl was to erect the necessary works, and the supply of gas was to be afforded before March 31 of the present year. We learn that the gas was sent into Little Hulton for the first time last Wednesday night; and everything passed off satisfactorily. Under the agreement entered into between the parties, the gas was to be of 14-candle power, tested by the "Metropolitan" No. 2 burner. As a matter of fact it was of 20-candle power, and its calorific value was 612 B.Th.U. gross. It is "whole" coke-oven gas, without fractionation or enrichment. The arrangements were carried out under the superintendence of Mr. Ernest Bury, the Manager of the Brackley Coke-Works, whose interesting paper, read before the Cleveland Institution of Engineers, dealing with the supply of coke-oven gas for town illumination, and giving an analysis of Brackley gas as compared with that supplied by one of the Metropolitan Companies and that produced in Glover-West vertical retorts, appeared in the "JOURNAL" last week. Mr. Bury, it may be remembered, read a paper on "The Carbonization of Coal, with Special Reference to the Bye-Product Coking Process," at the Dublin meeting of the Institution of Gas Engineers in 1907.

Electrical Dangers and Troubles.

It seems impossible for electricians to longer play off on the public with any success that old pretence of theirs that electricity as an agent for lighting, power, and heating is devoid of danger. The patrons of picture theatres, generally speaking, can hardly be reckoned among the users of electricity; but apparently they are well acquainted with the danger that surrounds its employment. The fusion of an electric wire connected with an electric ventilating fan, and the emission of sparks and a bluish light from the region of the fan, was the cause of the awful stampede of the audience at the Middlesbrough Picture Palace Hippodrome on Monday last week—resulting in two deaths and injury to several persons. As it happened, a wire had fused, and though sparks were flying from the ventilating fan, there was no occasion for alarm. But the fact remains that the people assembled were genuinely terrified, and there was an ugly rush, with the lamentable results that have been made public. Succeeding this event came the intelligence of the disastrous conflagration at the New York State Capitol, in which damage was incurred estimated at between £1,600,000 and £2,000,000. One life is believed to have been lost, and many priceless records destroyed. The fire, it is stated, was "due to an electric wire fusing"—that is how the reports run. On the same day (Wednesday), news came to hand that during a heavy fog in Sheffield, the electric current failed (for at least half an hour) those who had put their faith in it for illuminating, power, and heating purposes. Business in several places, it is reported, came to a standstill; and candles had to be hastily produced in the police courts to allow of the administration of justice. This was an awkward event coming upon the controversy aroused by the speech of Mr. Wilson Mappin at the recent meeting of the Sheffield Gas Company.

Ratepayers and Municipal Finance.

Referring to the question of municipal finance (to which the Lord Mayor of London addressed himself so seriously when welcoming the members of the Association of Municipal Corporations), the "Manchester Courier" remarks that it is not necessary to-day to point out what high rates mean to the trading and manufacturing classes of the community—the wail of the shopkeeper is, from its very persistence and monotony, in danger of passing unnoticed. This would be an unfortunate result; and we should be inclined to advise ratepayers not to cease their remonstrances from any fear that their persistence might defeat its own end. If a community in revolt will accomplish little, it is certain that a passive body of ratepayers can accomplish still less. Our Manchester contemporary is evidently of opinion that the only possibility of substantial relief lies in Parliament making further concessions in respect of the national services which municipalities are called upon to discharge. But Parliament is slow to move; and, meanwhile, the state of unrest is growing. Only a few days ago, a deputation from the local Trade Protection Society waited upon the Newcastle-on-Tyne City Council, in reference to a proposed increase in the rates. It was then urged that the burden upon the ratepayers was almost intolerable in the present state of trade, and that many of the citizens found the rates "the burden of their existence." At the subsequent meeting of the Council, reductions totalling nearly £13,000 were agreed to in the estimates of the Committees; and it was decided to take £12,000 from the tramways surplus. It may be taken that the councillors would have acted as they have done even without the intervention of the deputation; but, whether this be so or not in Newcastle, speaking generally there is little doubt that ratepayers would be acting more wisely by continuing their protestations, than by ceasing them on the ground that their persistence might result in them passing unnoticed.

Gas a "Superseded" Illuminant.

Alderman Love, the Chairman of the Devonport Electricity Committee, took advantage of a municipal inspection of the electricity works last week to boast of the progress of the undertaking of which he is the head, and to make some rather remarkable comparisons between electricity and gas. Among other things, he told his audience that gas had served its purpose well in the past, but had been superseded by electricity as an illuminant. At 3¾d. per unit (the price in Devonport), electricity, he contended, was cheaper to use than the very best quality of gas at 2s. 6d. per 1000 cubic feet. A test was made with a British metallic filament

lamp of 10-candle power, and they got 30 hours' light for 1d. There was, he added, no known test of gas giving, with this candle power, light for so long a time at so small a cost. No one present at the gathering challenged Alderman Love's figures and statements, though it must have seemed strange to hear that gas has ceased to count as an illuminant, when every street in Devonport except one is lighted by gas. As to the price comparison, Mr. Percy S. Hoyte, the Engineer and Manager of the Plymouth Gas Company, exposed some of Alderman Love's fallacies in a letter to the local Press. The bijou incandescent gas-burner, of which there are many thousands in use in the Plymouth district, will, he pointed out, give a light of 20 candles for upwards of 40 hours at a cost of 1d. The incandescent gas-lamp most in use is, however, one giving a light of about 75 candles, and consuming 4½ cubic feet per hour. With gas at 1s. 8d. per 1000 cubic feet—the price in Plymouth and Stonehouse—this can be used for 30 hours at a cost of only 2¾d.; while it would require 7½ of the Devonport 10-candle electric lamps to give a similar light, the cost of which would be 7½d. for 30 hours. Mr. Hoyte also showed that the cost of renewing metallic filament lamps was an item which has to be taken into account; and he called Alderman Love's attention to the fact that, though he spoke of it as an illuminant which had been "superseded," gas had been preferred to electricity for lighting the streets of Westminster.

The Position in South Wales.

The position of affairs in the disturbed coal-mining area of South Wales has not been improved as a result of the ballot taken recently on the question of whether the Cambrian Combine men should accept proposed terms of settlement of the strike. "Ballot," however, seems rather a mistaken word to apply to the voting, as, according to the local Press, little secrecy was observed. The result, roughly, was that 7000 men voted against accepting the owners' terms, and only 300 in favour of doing so. Shortly afterwards, the twelfth annual conference of the South Wales Miners' Federation was held; and the financial statement then presented showed what a disastrous effect the strike policy last year has had on the organization. The strike and lock-out pay, it was reported, had absorbed something like £100,000; and the members themselves are clearly getting sick of the present state of things, as, though the workers in the Welsh coalfields had agreed by a large majority to support the Mid-Rhondda strikers, comparativcly few of the districts have paid up the levies. Ultimately, in view of the urgent need of funds, it was decided, not only to appeal to all the employees in the coalfield to pay their levies promptly, but that the different districts should at once forward amounts covering the levies, whether or not these had been collected at the local lodges. This does not sound promising; and one can prophesy a further depletion of the dwindling reserve funds of the Federation. Another element in connection with the position of the Federation is the fact that, notwithstanding that there was an increase of about 10,000 in the number of persons employed in the coalfield, the membership of the Federation in 1910 was only 137,000, whereas in 1909 it was 141,000. In 1906, 70 per cent. of the persons employed in the coalfield were members of the Federation; while last year, the proportion was only 64 per cent. What, then, have the Federation gained for the enormous expenditure of money that has during the past twelve months been incurred? The Cambrian men themselves, finding that they were powerless to compel success, were seized with the idea of calling in the aid of a general strike of miners throughout the United Kingdom; but it is at least reassuring to have a statement from Mr. Thomas Ashton, the General Secretary of the Miners' Federation of Great Britain, that there is no hope of the rule providing for a general stoppage being put into operation, and the whole of the miners brought out on strike, in sympathy with a dispute that affects the men employed by one firm only.

A correspondent of the "Devon and Exeter Gazette" writes: Few men have the distinction of serving for so long a period as 50 years in one business. But such is the record of Mr. GEORGE L. DUNSFORD, who has just resigned his position of Chief Cashier to the Exeter Gas Company. In 1861, when Mr. Dunsford first joined the staff, the gas-works and offices were in Exe Island. He has seen the works removed to the present site at the Basin, and the offices successively to North Street, High Street, and Southernhay; while the business of the Company has enormously increased. In consideration of his long and faithful services, the Directors have voted Mr. Dunsford a retiring allowance.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 66.)

BUSINESS on the Stock Exchange last week was fairly active on the whole; but not all markets were as strong as they were the week before. Consols closed rather lower than they had opened, owing partially to realizations. But Home Rails had a fine time; and prices rose freely in spite of profit-snatching. A satisfactory feature was a Foreign Market free from agitation. The opening on Monday was tame and without much animation; symptoms of weakness being apparent here and there. Consols fell back ⅛; and Rails were uneven. Tuesday was a more active day, and the general tone was firmer. Several of the gilt-edged class advanced; but Consols did not do so. Railways were strong and active; and Americans improved. The Rubber Market was flat. Wednesday was rather quiet on the whole, but with points of activity. Government issues were dullish. But Corporations and Railway preferred were in demand; while the ordinaries were as strong as ever. Thursday was fairly active. The Railway Market was still the centre of attraction, and full of rise. Most of the rest were pretty good. Friday's course was much the same, though there was an amount of selling before the close. Gilt-edged things had some rise in them, and Rails were very good, though realizations took off some of the cream. Saturday was quiet, without much change. Consols, however, fell ⅛. The Money Market was easy until the ending of the quarter, when a sharp demand sent rates up. Business in the Gas Market was only moderate; and the bulk of the transactions marked was confined to a comparatively small number of issues. The tone of the market continued very firm, and several further advances in quotation were made. In Gaslight and Coke issues, the ordinary showed no increase in activity, but was very steady; all transactions being within the limits of 105½ and 106⅜. Secured issues were quiet; the maximum changing hands at 85¾, the preference at from 101⅛ to 102, and the debenture at 80 and 80¼. Rather more business was done in South Metropolitan. Prices were steady at from 119¼ to 120¾. In Commercials, the 4 per cent. was done at 114 free and 115, the 3½ per cent. at from 109¼ to 110, and the debenture at 78. Among the Suburban and Provincial group, Bournemouth "B" marked 16$\frac{5}{16}$, Brighton original 216, Bromley "B" 89, South Suburban 119 (a rise of 1), and (on the local Exchange) Liverpool "A" 215. In the Continental companies, Imperial was unchanged at from 191¼ to 192½, European was done at 19⅜ to 19⅞, and Tuscan at 9¼. Among undertakings of the remoter world, Bombay realized 6⅜ and 6$\frac{13}{16}$, ditto new 5¼ and 5⅜ (a rise of ¼), Monte Video from 13 to 13¼ (a rise of ¼), Primitiva from 7¾ to 7$\frac{15}{16}$, ditto preference from 5¼ to 5⅝, and ditto debenture 98½.

NOTES FROM WESTMINSTER.

THE principal gas and water matters that have been engaging the consideration of Committees during the past week are noticed in the succeeding paragraphs. The proceedings on the Bill of the Chesterfield Gas and Water Board have been temporarily suspended; but we may hear something more of it in a few days' time. Committee work hardly appears to have started before there is talk of the Easter holidays. The House of Lords are intending to give up work from next Thursday until the 26th; but the Commons are to be satisfied with a very few days' leisure. If the members get from the 13th to a return to work on the 19th, they will consider themselves fortunate. This will mean that the House of Lords will not be again taking up Private Bill Committee work until nearly the end of the month. How this will affect the sittings of the Joint Committee on the Metropolitan Water Board Bill remains to be seen. But it may be expected that the House of Commons will persevere with their part of Private Bill work immediately their brief holiday is over. Meanwhile, the prospects of further gas controversy in the Committee rooms become more shadowy day by day. Report states that in the case of the Swansea Gas Bill negotiations between the Company and the Corporation hold out the hope of a successful arrangement in regard to the gas-works extensions.

Northumberland Clause for Winchester.

It was a very poor case the Corporation of Winchester had to show Lord Southwark and his colleagues in support of the Bill by which they are seeking to purchase the property of the Electricity Company, for what must be regarded as an exorbitant price. Consideration of the proceedings before the Committee does not reveal a shred of evidence that the citizens will be a tittle the better off, but rather the reverse, by the electricity supply being transferred from the hands of the Company to those of the Corporation. There is no complaint against the Electricity Company; no evidence that they are not serving the citizens as well as, if not better than, the Corporation will be able to do with a capital hanging round their shoulders representing more than the original cost of plant, now some years old. The difference in the situation of the ratepayers (who have gone through the mock procedure of endorsing the Bill on obviously insufficient information) will be that, whereas they have had under the Company no financial obligations, and a service of which they have had no material cause to complain, they will now be subject to the risks involved by the making of both ends meet under the burden of a considerable capital account to which the City Council are committing them,

with, in addition, a branch of the business carried beyond the administrative jurisdiction of the Council, and the ratepayers of which district are in no wise responsible for the capital expenditure involved in the supply of the few customers there. The Company have gone outside their statutory area; and Mr. Balfour Browne, K.C., admits that this is *ultra vires*. The Corporation are also going beyond their administrative area with the supply of electricity if the Bill passes; and this is bad policy. As large ratepayers, the Gas and Water Company opposed. They were within their rights in doing so, though Mr. Balfour Browne said he might object to their *locus*, but preferred to have the matter fought out. If the learned Counsel had felt at all safe in objecting to the *locus* of the second largest ratepayers in the city, we think he would have done so rather than have to hand over the Bill to the promoters, as he has had to do, with the Northumberland clause safely lodged in it—a clause that the Corporation did not want, though the objection is weak against their avowed belief in the strength of the financial position in which they profess they will stand when they become the owners of the electricity undertaking. But there is no question that they are a little dubious as to things working out financially quite as they anticipate, seeing that they asked fo the absurdly long period of 45 years (reduced to 40 years before the measure left their Lordships' hands) in which to repay the loan for the purchase of a concern the plant of which is not new. However one looks at the matter, it is difficult to find that it is an economical bargain for the ratepayers. The Gas Company, as ratepayers and as competitors, are afraid of the result of this speculative purchase of the Corporation. The position of the Gas Company as ratepayers and competitors is not divisible. The more they have to pay away as ratepayers beyond a fair amount, the worse they are off in their position as traders. It is all very well to taunt them with being afraid of municipal competition. A mere tyro in business affairs must see that two companies competing do so on level ground; a municipal authority competing with a company is an altogether different matter—the disadvantage being on the side of the company. Local electrical contractors will confirm this. There was really no answer to the Gas Company's case, which was conducted by Mr. Honoratus Lloyd, K.C., and Mr. A. M. Paddon. The main part of the result of the inquiry before the Committee has been gathered. Forty years have been allowed for the repayment of the purchase money, which is too long, in view of the age of the plant, and will form a millstone round the necks of the ratepayers for the next four decades. Upon this will come new capital; and only twenty years is allowed for the repayment of this. It is difficult to reconcile the two periods by any sound reasoning. The Northumberland clause is to go in the measure. We are a little surprised that gas companies have not more frequently applied for the Northumberland clause. The Board of Trade are not so averse to it now as was at one time the case; and Lord Southwark's Committee appeared to accept its inclusion in the Bill much as a matter of course.

A Suspensory Clause. There has been a good tussle over the Sidmouth Gas Company's Bill before the Earl of Camperdown's Committee. The Company are now seeking full statutory powers, extension of the existing authorization of their Provisional Order, and they desire to enlarge their activities by entering into the supply of electricity. The electricity scheme was the principal bone of contention; but beyond that all the stock minutiæ of gas opposition was brought together by the Council to build up a case against the Gas Company. There is a particularly significant aspect of the fight. The Council, of course, opposed the electricity scheme of the Gas Company. The Council themselves obtained some time since electricity supply powers, but they did not exercise them. On the one hand, then, there is the question of electricity supply; on the other hand, there is the question of acquiring the Gas Company's property, powers, and business. The Council viewing the two are to-day in favour of buying up the gas undertaking, though they have said much about it that is not altogether complimentary. But still, with all its supposed faults, they have a preference for it. They are evidently sensible of which is the better business. This is interesting. While the Gas Company have got their Bill, with certain amendments in detail, it is held in suspension for a year, or rather a suspensory clause has been inserted, such as we have heard of during the past few sessions, which defers the powers obtained being exercised until after the council have had an opportunity of bringing in a Purchase Bill in the succeeding session. The suspensory clause has not the same effect as a purchase clause. A purchase clause debars a company opposing an application for purchase powers; and limits their appearance to the question of conditions in order to protect themselves. A suspensory clause in a case such as the present enables a company to fight the question of purchase tooth and nail.

Electricity and Other Powers. Quite a number of gas companies have obtained electricity supply powers during the past few sessions. We can readily roll off a few, without by any means exhausting the list. Ascot, Aldershot (part of outer district), Yorktown, Farnham, and Bishop's Stortford are cases in point. There is no doubt about it that an established concern, with all the resources of a gas company, can afford a supply of electricity quite as economically as anyone. Whether it is good policy for a gas company to do this is much a question of local circumstances; and it is also a question of more than one aspect in relation to protective considerations. In small places such as Sidmouth, Mr. Corbet Woodall is emphatically of opinion that it is desirable the two agencies should be controlled by one authority; and Lord Camperdown's Committee apparently saw the favourable arguments to such a concentration of the supplies, as they allowed the clauses to stand in the Sidmouth Bill. The Council were in an untenable position in this matter. They are supposed to study the interests of the ratepayers. But they evidently object to the economies derivable from the joint concern, and have a fancy for the uneconomies of two undertakings, in a small place like Sidmouth, working separately, and wasting substance which has to be found by the consumers. Mr. E. H. Stevenson was on the side of the Council; but he was very guarded over this question. One of the opinions that he expressed was that people could supply themselves with electricity at a cheaper rate than it could be furnished at from a central generating station such as is proposed in this case. It depends upon whether the requirements of a user for lighting purposes are sufficiently large for a private generating plant. If they are, then there are numerous instances of the truth of Mr. Stevenson's declaration. Among other points discussed, the Council were of opinion that the position of the gas-works destroys part of the amenities of Sidmouth. The Committee were not impressed by this, as they imposed no order upon the Company in this connection. It will be interesting to see whether, if a Purchase Bill is promoted next session, it will include a voluntary obligation on the part of the Council to remove the works to another site—say, to the north of the railway station, as suggested by Mr. Stevenson. The standard price proposed in the Bill was by oversight placed at 4s. 10d.—that being the present nominal ordinary charge without the heavy discount, of which the consumers naturally take very good care to avail themselves. Mr. Woodall considered 4s. 2d. would be a fair figure for the standard; the Council spoke of 3s. 8d.; while the Committee placed it at the even figure of 4s. A clause over which the Committee are somewhat doubtful as to how the Lord Chairman will regard it—and the point may be taken to be at present in abeyance—proposes that the scale of voting shall be one vote for every ordinary share and one for every two preference shares. Speaking generally, the proceedings on this Bill were of a very attenuated order, owing to the assiduous manner in which the opposition raked over the infinitesimal in search of material upon which to raise discussion.

Chester's Water. The attention of the Earl of Camperdown's Committee was transferred from gas and electricity to water supply; and they must have been rather doubtful as to what they had before them, when, on the Chester Water Company's Bill being called on, an array of Counsel was presented such as has not, excepting perhaps on the London Water Supply Bill, been seen before in the Committee rooms this session. The Company are seeking parliamentary sanction to the continuance of their present intake, power to construct a new reservoir, and certain other works. But the object of attack was part of the proposals the Company were making with the view of ensuring the purity of their water supply. The scheme contemplates the construction of works for the sedimentation of the water taken from the River Dee; and the Company also request powers to enforce in the basin of the Dee the provisions of the Rivers Pollution Prevention Acts. That was regarded as the sore point. Local authorities opposed the clauses, seeing in them the lever to compelling some heavy expenditure in keeping objectionable matter out of the Dee. By them the Company were admittedly taking upon themselves a heavy burden; but as Mr. Frederick Storr, their expert witness, submitted, it was a legitimate attempt in the public interest to deal with a grievance. At the same time it was made abundantly clear that if Parliament thought the Company should not have the right to exercise their powers as to pollution, they would still be able to supply water of admirable purity. The pollution clauses were struck out without calling on the opponents; and thereupon hostility collapsed, and the remainder of the Bill was allowed to proceed. Various protective clauses have been inserted—one prohibiting the Company from supplying water in any area in which the Liverpool Corporation have statutory right to supply unless the Corporation give their consent. The Corporation of Chester, Duke of Westminster, and Trustees of the Huntington Hall Estate also obtained clauses.

Paignton Water. There was a considerable attack upon the water section of the Paignton District Council Bill before the Local Legislation Committee last week by the Dart District Fishery Board, who consider, in some sort of vague way, that their rights will be prejudicially affected by the proposals. The Council have planned the construction of new filter-beds and pipe works, at a total estimated expenditure of £27,500. The supply from Paignton extends over a large district; and the needs of Teignmouth appear to be very much wrapped up in the powers now sought. We need not run over the points raised—the result confirming the project of the Council, who are placed under the not very onerous condition of providing and maintaining a self-recording gauge, which shall be open to the inspection of the Fishery Board.

Thames Reservoirs. The Bill, promoted by the Metropolitan Water Board, for power to construct extensive water-works in the Thames Valley, which has evoked considerable controversy and opposition—no fewer than 64 petitions having been lodged against the scheme—is now before a Joint Committee of both Houses of Parliament, presided over by the Earl of Kintore. It has been found necessary to requisition

one of the large Grand Committee Rooms for the inquiry, in order to satisfy the demand for accommodation. The Thames Conservancy Bill, which is in a measure bound up with the other, has been referred to the same Committee. We will not at present allude to the general proceedings beyond saying that the proposed new works of the Board seek to provide for the water needs of London for the next thirty years by a system of storage reservoirs in the Thames Valley—an expenditure of some 7 millions sterling being involved. The Counsel who are appearing for the Board are Mr. Balfour Browne, K.C., Mr. J. D. Fitzgerald, K.C., Mr. Courthope Munroe, and Mr. Harbinson. The burden of the technical evidence is falling upon the Board's Engineer (Mr. W. B. Bryan). The proceedings on such a scheme as this, and with such an opposition, are bound to be protracted.

ELECTRICITY SUPPLY MEMORANDA.

Fixed Prices per Lamp and Speculation—Outside Shop Lighting—Cookers and Costs—Ethics of Advertising—Six Days Shalt thou Labour—Machinery Breakdowns.

TARIFFS are to the front again. The question has a pretty little freakish way of imposing itself upon consideration; the cause being the obstinacy of the electric lighting business in dwelling-houses to make any considerable headway. We like the subject for the reason that it affords a large amount of interest to watch the manifold ingenuity exercised by electrical engineers to wriggle out of what is practically a *cul de sac* formed by the heavier annual costs of electricity, light for light, than is involved by using the more popular competitor. All the new schemes of charging have for their object the obtaining of more business; some of them have, as a secondary object, the concealing from the consumers precisely what their lighting is costing them, unless they are cute enough to total up the expenses at the end of the year. But we will not labour the point too much. The fact that the purveyors of electricity can only make snail-like progress in the lighting business on the ordinary system of sale—the application of flat-rates and discounts for large quantity—should command our profound sympathy; and this we give with a generosity that it is hoped will receive its reward in admiration—if not thanks.

Mr. E. E. Hoadley, the Electrical Engineer of Maidstone, was struck, we think it was about April of last year (the matter was noticed in the "Memoranda" on the 19th of that month), with the idea of charging a fixed price per lamp per annum. The proposal has evidently been in suspension since then; but the necessity for doing something—good, bad, or indifferent—to give a fillip to the lighting business remains. The fixed price per lamp idea appears to be the scheme *ne plus ultra* for the purpose. So up it has come again; and the Town Council are now going to let Mr. Hoadley have a run with it. We like Mr. Hoadley, because he tells us all about his scheme, and how he arrives at his figures. He is going to charge 10s. per lamp per annum for a 32-watt metallic filament lamp; or, in the case of dwelling-houses using electricity throughout for lighting, 8s. per lamp a year. Incidentally, we wish the electrical industry had not fallen so largely into the habit of designating the nominal value of their lamps by the wattage. It is a little disconcerting to the non-technical user. Mr. Hoadley, however, mentions that these lamps are of 25-candle power, which is equal to 1·28 watts per candle power. It is being found out that such a wattage is a little bit low. It was pointed out by Mr. Haydn Harrison lately that such an average wattage was below the truth; and he had verified this by tests of thousands of lamps. The National Physical Laboratory have lately been testing some Osram lamps, and, under all the precision of laboratory control to ensure constancy, the wattage at the start was 1·33 per candle power and at the end of 2000 hours 1·43 watts. That is not, however, a matter over which to be hypercritical; but it just shows the actual consumption of these lamps is not so near the 1 watt per candle power as some electricians claim.

Examining the statement as to how Mr. Hoadley arrives at his fixed charge of 10s. per 25-candle power lamp (8s. for dwelling-houses using only electricity for lighting), he says that last year the capital charges and cost of production at Maidstone amounted to £10,800. He deducts the tramways costs; and there remains £8625. Of this, the non-variable charges account for no less than £7475; and the running or variable charges for £1150. He includes in the non-variable charges: Capital charges, loan and inquiry expenses, insurances, general establishment charges, stationery and printing, salaries of staff, rates and taxes, repairs to meters, repairs to mains, and wages of jointers, linesmen, and meter readers. To these he adds a certain proportion (ascertained by experiment) of variable charges—consisting of repairs and maintenance of buildings and plant, wages at generating station, oil, water, and stores, and coal. We do not see that he embraces anything for depreciation and reserve. Taking the £7475 representing his figure for non-variable charges on last year's accounts, the department had to provide for a maximum load of 590 kilowatts, which meant that before there was any profit each kilowatt should bring in £12 13s. 4d. After receiving this sum, each unit cost (dividing the total of the variable charges £1150 by the 1,027,853 units supplied) 0·265d. We see that in the "Electrical Times" tables coal alone cost 0·38d. per unit! However, Mr. Hoadley then adds 10 per cent. profit to both the fixed and the running costs; so arriving at a fixed sum of £14 per kilowatt and 0·29d. per unit. A kilowatt of plant will keep (at his figure of 1·28 watts per candle power) thirty-two 25-candle power lamps alight at one time. Therefore the fixed charge for each lamp would be 8s. 9d., to which has to be added the cost of the number of units likely to be consumed. Taking 1000 hours per annum as the use per lamp (that is, only an average of 2·7 hours per day), each 25-candle power lamp would consume 32 units a year, which at 0·3d. per unit would amount to 9½d., making, with the 8s. 9d., 9s. 6½d. a year, including the 10 per cent. profit. But to be on the safe side, Mr. Hoadley proposes 10s.—a price that does not include lamp renewals. Having arrived at this 10s. per 25-candle power lamp for 1000 hours' use, Mr. Hoadley proceeds to knock the factor of safety on the head. He thinks that only three parts of the lamps in a dwelling house would be in use at one time; and therefore where only electricity is used for lighting, 8s. per 25-candle power lamp may be the charge. This 8s. is 1s. 6½d. below the amount necessary, according to Mr. Hoadley's calculations on last year's figures, to ensure a profit; and it seems to us that it is somewhat dangerous to depart from the average in such a case. There is nothing to prevent a consumer using all his lamps at once; and there is nothing to prevent him running them for more than the average of 1000 hours a year. As it is, on hypothetical figures as to use, the margin of profit is very small at 10s. per lamp, There is no margin on the 8s.—it may, in many instances, be a *minus* quantity. There is too much assumption about the scheme for an ordinary practical business man.

Now supposing Mr. Hoadley's figures work out in a hard-and-fast way as he hopes they will, he will only, on the 8s. per 25-candle power lamp per annum, be receiving 3d. per unit for the current; at 10s. per lamp, 3·75d. How does this compare with the average charge per unit to the present householder? Further, at the 8s. per lamp, under this scheme, a householder with 25-candle power lamps about his house would have to pay £10 a year. This £10 a year with gas at 3s. per 1000 cubic feet would supply gas sufficient to keep 66 bijou inverted burners running for 1000 hours; and at 2s. 6d. per 1000 cubic feet 80 similar lamps. But there it is, on Mr. Hoadley's own showing, under the Maidstone conditions, he cannot supply electricity to a 25-candle metallic filament lamp, at a profit, under 10s. per 1000 hours. It will be a very simple matter for the Maidstone Gas Company to show a consumer what a 25-candle power inverted gas-lamp will cost him for gas for 1000 hours. It would be interesting if Mr. Hoadley would apply calculations on similar lines to charges for power and heating, and see how they work out in relation to the actual charges for such purposes.

The managements of electricity undertakings, as recently shown in these notes, are suffering severe torture over the spread of the high-pressure parade system and other high-power gas-lamps for the exterior lighting of shops. In many districts, they are striving to meet the competition, and are attempting to enter into fresh contracts for definite periods with gas. We observe that the Croydon Borough Council have, on the recommendation of the Electricity Committee, passed a resolution agreeing to supply electric current for outside shop lighting at 3d. per unit, subject to a three years' agreement. This is another illustration of the way the wind is blowing.

It is observed that some of the electricity concerns with experience are not very anxious to take upon themselves further responsibility in connection with the supply of electrical appliances on hire or hire-purchase. The Beckenham District Council have had a bad experience of the financial effects of free wiring. Now there is a proposition (which has been agreed to by the Council) to let consumers have motors, cookers, radiators, vacuum cleaners, and so forth, on the hire-purchase system. In this matter, however, the Council are merely going to act as the agents of the Berry Construction Company; and they will collect the agreed payments along with the charges for electricity, but with the stipulation that they are not to be responsible for bad debts. Cautious Council! A start is to be made with twenty cookers. That is modest. When these have been installed, or at the end of twelve months, whichever may first occur, the Council are going to reconsider the terms. Somehow we have an idea that they need not worry themselves much as to when there will have to be reconsideration. It is quite plain that it is not, in reality, anticipated that the demand for the twenty cookers will be at a fast rate. If the Electric Lighting Committee, the Engineer, and his staff could persuade their wives, or their mothers, or whoever happen to be the monarchs of the houses at which they reside, to try these cookers, the twenty ought to be soon disposed of. But those in the know, if asked to adopt an electric cooker, smile broadly. The smile that an electrical engineer once gave when asked why he did not adopt a "Therol" water-heater is an ineffaceable memory. It is one of the pleasures of a gas manager's life to read the suave and fanciful talk of some electrical engineers on this subject—such talk as Mr. F. A. Simpson, the Engineer of the Newmarket Electric Light Company, gave utterance to when facing the shareholders recently. He remarked that the efficiency of electrical cooking and heating apparatus was four times that of gas, and, at the price the Company were prepared to quote, cooking by electricity would be quite as economical as cooking by gas, besides, being much cleaner, more convenient, and free from noxious fumes. We should like to have Mr. Simpson's particulars of proof; but that gentleman has not hitherto shown any disposition to enter into controversy with us. If the "quite as economical" is not the truth, then what is it? The subject need not be pursued. But reverting to Beckenham, the twenty cookers will be, or rather are proposed to be, on hire at

an inclusive charge of 1¼d. per unit throughout the year, excepting for two hours after dusk on each day in the months from October to March inclusive, when the charge will be 4d. per unit! These electrical tariff inventors are really killing. There is some fear, too, that the users may, after a bit, fight shy of the cookers, and so they are to guarantee a minimum consumption of 120 units per quarter, which means £3 a year certain at 1¼d.—*plus* the extra for the fourpenny units each day for two hours after dusk in the months of October to March, which is the time cooking generally goes on in the houses of City business men residing in the attractive district of Beckenham.

Though the sky has long been overcast, though progress has been slow, though dividends have been puny, there are sometimes men at meetings of electricity supply companies who, under the depressing circumstances, are still able to make light, if somewhat shallow, speeches. The speeches occasionally touch on the humorous. We have just been reading the report of an amusing one by Mr. William May, at the meeting of the Reading Electric Supply Company. It was composed largely of the ordinary trite platitudes that are intended to put a little stiffening into the shaky hope of shareholders in those electricity undertakings that have had a bad time. It is seen by the report of the proceedings at the Reading meeting that Mr. May has a fondness for the expression "in the long run." As a rule, he says, those who sold the better article got the best of the trade "in the long run." True! Again, they would find "in the long run" that electricity cost the consumer less—presumably than gas. Untrue! He did not think there could be much doubt as to which of the industries would get the best of it "in the long run." Nor do we. The Reading Company, we believe, have been running now for some sixteen or seventeen years; and that is a very "long run." In "the long run," the better article has undoubtedly got the best of the trade, as is disclosed by a comparison of the accounts of the two Companies. The Electricity Company have really had a rough time of it, and have only just succeeded in getting back to a 2½ per cent. dividend. They were doing better than that when their business was smaller than it is now. Last year they sold 73,226 more units than the year before; but only 20,158 of these additional units were at lighting prices, while 53,068 were at the low figures charged for heating and power. Such progress requires many humorous speeches to back it up.

Mr. May suffers from very common electrical delusions. He has somehow or other got it into his head that the Gas Company object to the Electricity Company advertising their existence. Now it is very absurd of Mr. May to think this of the Gas Company. But when the Electric Supply Company descend to the advertising of such falsehoods as that gas totally destitute of sulphuretted hydrogen evolves that compound in its free combustion, and when they persist in refusing to recognize the comment Dr. Hurry (one of the Directors of the Gas Company) has made upon their use of a quotation from an article of his of some time since, while continuing the publication of the extract in a manner that makes a very personal matter of it, then all we can say is that their own methods of advertising are not above reproach, but are very much to their discredit. Mr. May asserts that the Gas Company have made ridiculous comparisons about the cost of the two lights and as to the relative hygienic values. We are very much afraid that the boot is on the other leg; and that the ridiculous character of the Electric Company's advertisements has been so palpable that the public recognize what the responsible persons connected with the Company (including Mr. May) entirely fail to appreciate.

A shareholder at the meeting hoped that the Company would avoid, as far as possible, Sunday work. He ought, in the commercial interests of the concern to have exercised more caution than to have publicly referred to such a matter. The Sabbatarians among the consumers, and those who have the management of churches and chapels that are electrically lighted, may, if their attention is too pointedly directed to the matter, have their consciences seriously disturbed on learning that they are giving patronage to an illuminant that has to be generated on the Sabbath, and so causes an infringement of the fourth instruction in the decalogue, while there is an alternative in the form of gas that is drawn on Sunday from that made and stored on the Saturday. Of course, it is the misfortune of electricity supply concerns that the means of storage to tide them over any length of time are prohibitive and impracticable, and that is why they cannot offer the consumer any defence against extinction of lights and stoppage of motors on the occasion of accidents, which happen in and about the best of regulated electrical systems—somewhat too frequently to be to the commercial advantage of electricity undertakings.

We think we may leave the following statement made by the Chairman at the annual meeting of the British Engine, Boiler, and Electrical Insurance Company, Limited, to take care of itself: "While the increase in business during the year 1910 had been highly satisfactory, there had also been a considerable increase in the item of claims as compared with the preceding year. There seemed to be no particular reason why the ratio of claims for steam-engines and dynamos should have increased so much as it had done (in the case of dynamos the increase was nearly 25 per cent.); but it was somewhat remarkable that their heaviest losses had been on re-insurances for other companies, where the inspections were not undertaken by their own staff. Among electric motors (in which class of their business there was practically no re-insurance) the ratio of breakdown was almost identically the same as in previous years—viz., one breakdown for every eight motors insured."

RATING OF GAS AND WATER UNDERTAKINGS,

WITH AN OUTLINE OF GENERAL PROCEDURE OUTSIDE THE METROPOLIS.

By Arthur Valon, Assoc.M.Inst.C.E.

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VII.—*Conclusion.*

Appeals to Sessions.

General.—Having made an objection before the Assessment Committee, and failed to obtain relief, an appeal may be made against the rate either to special sessions or quarter sessions; but under the Union Assessment Committee Amendment Act, 1864, before an appeal against the rate can be made to sessions, it is necessary to object to the valuation list before the committee, even though the assessment committee have no power to deal with the grounds of objection.

Grounds of Appeal.—An appeal may be taken to quarter sessions upon every ground and upon every point; but to special sessions only on the ground of inequality, unfairness, or incorrectness of the valuation [Parochial Assessments Act, 1836, section 6]. If, therefore, an appeal is upon any other ground than these, it must be taken direct to quarter sessions. An appeal to special sessions is generally cheaper than to quarter sessions; but it should be remembered that there is an appeal to quarter sessions from special sessions, and that where the matter is so important as to render it probable that the losing party will not be content with the decision of special sessions, it is desirable to appeal direct to quarter sessions.

Next Practicable Sessions.—The appeal, whether to special or to quarter sessions, must be made to the next practicable sessions—*i.e.*, if it is desired to appeal to special sessions it must be to the next practicable special sessions, and if to quarter sessions, then to the next practicable quarter sessions.

As it is necessary to give 21 days' notice to the assessment committee, it is clear that the time between the committee's decision and the next practicable sessions must be longer than this. How much longer depends entirely upon what must be done before the appellant can decide as to whether he will lodge an appeal or not. It has been held that two days was a reasonable time [*R. v. Herefordshire*, J.J., 3, T.R., 504], and also that it was not [*R. v. Sussex*, J.J., 15 East 206, and *R. v. Essex*, J.J., 1 B. & Ald. 210]. In another case, it was held that seven clear days was sufficient [*Liverpool Gas Company v. Everton*, L. R., 6 C.P. 414]; each decision depending upon the exact circumstances of the case. [See *R. v. Justices of Carmarthen* 1893 (Ryde's Rating Appeals 1891-93, p. 334)].

If there is no time before the next sessions to give the notices, it will be quite safe to miss those sessions; but where there is just time to give the notices, it is better to enter the appeal, and, if desired, apply for a respite to the following sessions, although it must be remembered this need not necessarily be granted.

It would seem that where an appeal has been entered but the necessary notices have not been given, or not given in time, the appeal must be respited to the next sessions [under section 4, Poor Relief Act, 1743 (*R. v. De Grey*, 1 Q B., 521)], which indicates a way out of some difficulties. [See *R. v. West Riding*, J.J. (*Ex parte Denaby and Cadeby Main Collieries, Limited*), Konstam's Rating Appeals, 1904-1908, p. 731.]

Special Sessions.

Notices.—If it is decided to appeal to special sessions, the following notices have to be given:—

1.—Twenty-one days' notice in writing to the assessment committee [U.A.C.A. Act, 1864, section 1], one day reckoned inclusively and one exclusively, intimating the intention to appeal and the grounds.

2.—At least seven days' notice in writing to the collector, overseers, or other persons by whom the rate was made. [Parochial Assessments Act, 1836, section 6.] Seven days must intervene between the day on which notice was given and on which the sessions are held. It has been held that notice given to one overseer is sufficient. [*R. v. Devon J.J.* 3 New Sess. Cas. 96.]

3.—(*a*) At least seven days to the parish council.

(*b*) To the parish meeting in rural districts not having a parish council, where the county council have made an order under the Local Government Act, 1894.

(*c*) To any authority to whom the overseers' powers under the Local Government Act, 1894, have been transferred by the Local Government Board. [*See* remarks under "Objections against the Valuation List"—"Journal," March 28, p. 912.]

4.—Notice to any third person where an appeal is made against the rating of property for which he is liable. [Poor Rate Act, 1801, section 6.]

Signing of Notice.—Notices should be signed by the appellant. In the case of a company, it would probably be sufficient for it to be signed by the Secretary if properly authorized; but it is better that in this case the notice should be signed by the solicitor.

Serving of Notice.—(*a*) The notice to the assessment committee may be left at the office of the clerk to the guardians, or sent through the post office addressed to the

committee at such clerk's office, or may be delivered personally to the clerk, or at his usual place of abode. [U.A.C. Act, 1862, section 42.]

(*b*) The notice must be served personally on the churchwardens, overseers, or persons who made the rate, on any other person whose rate is the subject of appeal, and on the clerk to the parish council in rural parishes. If the notice is sent by post, the objector takes the risk in case the notice does not reach the overseers.

Notice of Objection.—See remarks under "Objections against the Valuation List" [*vide supra*].

Time and Place of Holding Sessions.—Twenty-eight days' notice of the time and place of holding the special sessions is given; the notice being placed on or near to the door of the parish church. [Parochial Assessments Act, 1836, section 6.]

Valuation List to be Altered.—If the rate appealed against is amended at special or quarter sessions, the assessment committee have to alter the valuation list in accordance with the decision made. [U.A.C. Act, 1862, section 22.] Repayment applies to the whole of a rate, though one instalment may have been paid before notice of objection was given.

Assessment Committee as Respondents.—The assessment committee are entitled, with the consent of the guardians of the union, after notice has been sent to every guardian, to appear as respondents at special sessions, as at quarter sessions. [U.A.C.A. Act, 1864, section 2.]

Appeal from Special Sessions to Quarter Sessions.—If it is desired to appeal from special sessions to quarter sessions, notice of the intention to appeal, and of the matter or cause of such appeal, must be given in writing to the person or persons in whose favour the decision has been made. [P.A. Act, 1836, section 6.]

Length of Notice.—When appealing from special to quarter sessions, the length of the notice will be fourteen days [P.A. Act, 1836, section 6], except possibly in the case of the assessment committee, who may perhaps be considered to be entitled to twenty-one days' notice under the Union Assessment Committee Amendment Act, 1864, section 1; and this should be given if possible.

As the appeal must be to the next practicable sessions, it may be necessary to enter the appeal whether the length of notice can be given or not. It is therefore desirable to settle beforehand whether an appeal will be made to quarter sessions in case of an adverse decision.

Quarter Sessions.

Notices.—The following notices have to be given when appealing to quarter sessions:

1.—Twenty-one days' notice in writing to the assessment committee [U.A.C.A. Act, 1864, section 1], one day reckoned inclusively and one exclusively, intimating the intention to appeal and the grounds.

2.—In the case of all respondents other than the assessment committee—*i.e.*, to the churchwardens and overseers, to the parish council, parish meeting, or other authority (*vide supra*, "Special Sessions"), and to any third person—fourteen clear days' notice at least has to be given. [Quarter Sessions Act, 1849, section 1.]

Signing of Notice.—Notices must be in writing "signed by the person giving the same or by his attorney on his behalf." [Quarter Sessions Act, 1849, section 1.] In the case of a company, it would probably be sufficient for it to be signed by the secretary, if properly authorized; but it is better that in this case the notice should be signed by the solicitor.

Serving of Notice.—(*a*) The notice to the assessment committee may be left at the office of the clerk to the guardians, or sent through the post office addressed to the committee at any such clerk's office, or may be delivered personally to the clerk, or at his usual place of abode. [U.A.C. Act, 1862, section 42.]

(*b*) The notice to the churchwardens and overseers, or any two of them [Poor Rate Act, 1801, section 4], and also to any third person whose rating is the subject of appeal [Poor Rate Act, 1801, section 6], has to be delivered to or left at their places of abode.

(*c*) Notice to the parish council may be given to the clerk to the council. [L.G. Act, 1894, schedule 1, pt. II., r. 15.]

Except with regard to the assessment committee, service by post does not appear to be expressly authorized, and if the notice is served in this way the objector takes the risk in case it is not delivered.

Notice of Objection.—See remarks under "Objections against the Valuation List" [*vide supra*].

Production of Rate-Books at Sessions.—In appeals to quarter sessions the rate-book is produced [Poor Relief Act, 1743, section 13], and amended by the justices in accordance with the decisions given.

Appeal against Net Rateable Value only.—The assessment committee and the parish officers are bound by the gross value in the valuation lists and the rate. In an appeal against an assessment, if the appellant does not appeal against the gross value, and contends that sufficient deduction has not been made from the gross value to arrive at the rateable value, the respondents cannot give evidence to show that they have fixed the gross value too low. [*Southampton Docks Company v. Southampton Guardians*, 51 J.P. 56, Q.S.]

Payment of Rate Pending Appeal.—Until an appeal has been heard and determined, no greater sum can be recovered from the appellant than that at which he was assessed in the last effective rate. [Poor Rate Act, 1801, section 2.]

Time for Holding Quarter Sessions.—Quarter sessions are held "in the first week after Oct. 11, in the first week after Dec. 28, in the first week after March 31, and in the first week after June 24. [II. Geo. IV., and I. Will. IV. c. 70, s. 35].

Valuation List to be Altered.—If the rate appealed against is amended at special or quarter sessions, the assessment committee have to alter the valuation list in accordance with the decision made. [U.A.C. Act, 1862, section 22.]

Assessment Committee as Respondents.—The assessment committee are entitled, with the consent of the guardians of the union, after notice has been sent to every guardian, to appear as respondents. [U.A.C.A. Act, 1864, section 2.]

GAS, OIL, AND AIR ENGINES.*

This standard work on the gas, oil, and air engine has reached the fifth edition; and it is now eighteen years since the first one made its appearance. Since then, the volume has been much enlarged to keep pace with new developments. The progress made throughout this period has been steady and gradual, and there has been no going back. Many workers have assisted in the improvement of the internal combustion engine, with the result that the reliability and economy with which they convert heat into power has now reached a high pitch of excellence.

Since the publication of the fourth edition of the work, in 1905, developments have not been in the direction of any marked departure in design, although a good deal of improvement has been made in the details of the working parts. It is an advantage that the trend of modern practice seems to be leading to greater uniformity of design than has hitherto existed. As is pointed out, there are indications of a rapid increase in the application of the internal combustion engine to marine work. Experiments on a large scale are in progress; and important developments may be expected during the next few years. This is as it should be; and no engineer will dispute the fact that it is highly desirable that the practical application of the gas-engine to all classes of marine work should be made on a larger and more exhaustive scale than has been the case in the past. The class of fuel to be employed is a moot point, though the trend of recent developments indicates the use of oil. But in any case, the great advantage lies in the fact that with the internal combustion engine the power developed per cubic foot of fuel storage is very largely in excess of that where coal is used in boilers.

In the present edition, a new chapter (XIII.) on the theory of the gas-engine has been written by Professor Burstall, who has contributed a new section (Chapter XIV.) on the chemical composition of power gases. The chapters on modern British gas-engines (VII.) and British oil-engines (XX.) have been almost entirely rewritten by Mr. T. Graves Smith, who has also contributed much new matter to the chapters on gas production for motive power (XI.) and practical applications of gas and oil engines (XXIV.).

The volume is divided into three parts, dealing with the gas-engine, the petroleum-engine, and the air-engine respectively. The contents number no less than 629 pages; and there are 243 illustrations. Rather more than half the book is devoted to the gas-engine; the remainder deals with the oil-engine, with the exception of the last chapter. Much of the early portion of the volume, explaining the principle of the gas-engine, and that relating to historical matters, is unchanged; and until Chapter VII., on modern British gas-engines, there is little which calls for special comment. With the first paragraph in this chapter we cannot agree. The authors still give credence to a statement by Sir W. Siemens—which was true at the time it was made—to the effect that coal-gas gives more light when furnishing power electrically through a gas-engine and dynamo than when the same quantity of gas is burnt in the ordinary way (presumably in a flat-flame burner). This has been totally incorrect since the practical application of the mantle was first made. And the authors, too, attach somewhat undue importance to the demand which has arisen for gas-engines to drive dynamos in country mansions; and to this demand, combined with the expiration of the Otto patent, they attribute the "great development of gas-engines within the last few years in England." Considering that the same reasoning may be found in the first volume, published in 1893, we hardly think that, even by a stretch of imagination, it can be said to apply now—eighteen years later.

In this chapter are given the chief characteristics of no less than 27 makers of gas-engines. Among so many excellent types of engines it would be invidious to discriminate; but it is noteworthy that there is a distinct tendency to increase the number of cylinders to develop comparatively small powers. This is all in the right direction, and must do much to maintain a uniform speed in running. This tendency has been especially noticeable in the development of the petrol-engine, in which type of engine the days of the single cylinder are numbered, and not without good reason. The vertical engine, with three, four, and six cylinders, is increasing in popularity; and it is a type of engine which, taking up very little space, is bound to come into more general use. It is noticed that several makers are now laying themselves out to

* A Text-Book on Gas, Oil, and Air Engines. By Bryan Donkin, with revision by Professor Burstall and T. Graves Smith, M.I.M.E. Fifth edition. London: Charles Griffin and Co.; 1911. Price 25s. net.

provide engines of 1000 H.P. to 3000 H.P. In this chapter is also included a description and diagram of that most excellent invention the Humphrey internal combustion pump. Descriptions of well-known French and German engines are given on the same lines as in the chapter on modern British gas-engines. Many and various are the types of gas-producers described and illustrated on the usual stereotyped lines. For all that is contained in the volume, the use of town gas for driving engines might be unknown, instead of providing the power for thousands of engines throughout the country, and in many cases for very large engines. Even so long ago as 1905, Mr. Dugald Clerk, in a lecture on "Coal Gas and its Rival for Motive Power," stated that "altogether, so far as I can estimate, there appears to be at work in Great Britain and Ireland something like 1,000,000 H.P. in internal combustion motors, mostly driven by coal gas."

The contract successfully obtained by the South Suburban Gas Company for the Festival of Empire Exhibition at the Crystal Palace gives most substantial proof that engines of 1000 H.P. may be economically worked by town gas. It will be remembered that the Company have, in competition with the local Electric Light Company, successfully tendered for supplying the power, by means of gas-engines, for generating the electric current required for lighting the buildings which are being erected in the grounds of the Crystal Palace with electric lamps, and for driving the "All Red Route." For this purpose, they are installing two 1000 H.P. and one 750 H.P. gas-engines to be used entirely with coal gas. Compilers of works on the gas-engine should note this success, and not be so ready to ignore the claims of town gas as an economical power producer. Information to prove this can be obtained from scores of gas undertakings throughout the country; and it should not be overlooked that in most cases discounts up to 30 per cent. are given to users of gas for power purposes.

In a chapter on the "Utilization of Blast-Furnace and Coke-Oven Gases for Power," this important subject receives the attention it deserves. The remainder of the volume devoted to the gas-engine deals with the theoretical principles of gas-engine working. The "Theory of the Gas-Engine," the "Chemical Composition of Gas in an Engine Cylinder," the "Utilization of Heat," "Explosion and Combustion," are all excellent chapters; and the subjects are very ably dealt with. At the end of the volume is given a comprehensive list of tables in Appendix "A," in which are recorded the results of scores of experiments with various gas-engines and fuels. A short *résumé* of each of these tables is also included.

The subject of oil and oil engines is treated on the same comprehensive scale as that devoted to the gas-engine. The discovery, utilization, and properties of oil are of interest to many gas engineers, as also are systems for making oil gas and the vaporization of oil in carburettors. In this part of the volume, the authors give a descriptive account of the "Practical Applications of Gas and Oil Engines;" and here may be found brief notes on subjects such as "Tramways Driven by Gas," "Use of Gas for Providing Motive Power in Water-Works," "The Gas-Turbine," to which latter subject scant consideration is given. Part III. treats of the little-known and somewhat obsolete air-engine.

Taking this important work as a whole, it is difficult to find fault, and, with the exception of the neglect with which town gas is treated throughout the volume, it is only in the matter of details that it is possible to criticize. It fully maintains the excellent reputation gained by previous editions. The explanations given are always clear and concise; and in the matter of style, the book is indeed a pleasure to read. This work may be strongly recommended to both the student and the man of practical experience.

The Bunsen Centenary.—In the "JOURNAL" for the 21st ult., it was mentioned that it was the intention of old Heidelberg students in this country to send an address to the University on the occasion of the Bunsen centenary on the 31st of March. In the course of it they said they desired to give expression to the feelings of esteem and affection in which they held Bunsen's memory. "We shall ever," they said, "regard it as one of the most fortunate circumstances of our lives that we have enjoyed the opportunity of coming under his personal influence as a teacher and investigator, and of learning to know and to appreciate the beauty, simplicity, and dignity of his character."

Steel and Concrete Pipes.—Combination steel and reinforced concrete pipes were used by MM. Coignet and Bonna in constructing the sewerage works of Paris at Achères sixteen to eighteen years ago. In the extension of these works, the same type of pipe is still being used. As described in the "Transactions" of the Concrete Institute, they are made in sizes from 12 inches to about 3 ft. 6 in. diameter, and consist of a thin steel tube lined inside and out with concrete reinforced with circumferential and longitudinal bars. One of the larger pipes laid about seventeen years ago was cut out and removed four years since in order to put in a junction; and it was found that the steel was practically clean, and that the concrete was lying close against it. A modification of this pipe, which is known as the Bonna pipe, has been used on two rising mains of the Paris sewerage system, which are under a maximum head of about 56 feet. These mains are each about 6 feet in diameter, with steel shell about 0·15 inch thick, which forms the inner lining. In these pipes concrete is placed inside the shell; the strength being contributed solely by the outer reinforced concrete casing, which is 4 inches thick, and is reinforced in the conventional manner. The large rising mains were made in sections about 8 feet long.

SURFACE COMBUSTION, AND ITS INDUSTRIAL APPLICATIONS.

Lecture by Professor W. A. Bone, D.Sc., Ph.D., F.R.S.

The famous lecture theatre of the Royal Institution of Great Britain last Thursday afternoon contained a large audience drawn together to hear of the revival of the subject of surface combustion, and the fresh advance achieved in it, by Dr. W. A. Bone, Livesey Professor of Applied Chemistry at the University of Leeds. Among those present were observed the President of the Institution of Gas Engineers (Mr. Alex. Wilson), several gas engineers who have taken special interest in this subject, gas chemists, and the technical representatives of various firms engaged in the manufacture of heating appliances, as well as gentlemen employed in the development of the application of high-pressure gas to lighting and industrial work. This first lecture was devoted to the scientific aspects of surface combustion; the second, to be delivered next Thursday, will take the form of a demonstration of the applications of the new process of incandescent surface combustion to industrial purposes. A large part of the lecture last Thursday was delivered by the aid of curves, of tables, and of drawings thrown on to a screen. In view of the place being in darkness, and the highly technical character of much of the lecture, we cannot do more than give an abstract report.

In his introductory remarks, Professor Bone said the subject of surface combustion may be considered from two aspects—from the point of view of its scientific interest in the first place, and, in the second place, of its industrial applications. In this lecture, the first of these aspects would be discussed. The phenomenon of surface combustion is primarily due to the accelerating influence of hot surfaces upon chemical changes in gaseous systems. To take a simple example, if a mixture of hydrogen and oxygen in their combining proportions—electrolytic gas—be heated in an enclosed space at atmospheric pressure, they will begin to combine very slowly at a temperature of 500° C. or thereabouts. But the rate of combination would be insufficient to cause any self-heating of the mixture. If, however, the temperature of the enclosure be slightly raised, a point would presently be reached—about 550° C.—at which self-heating of the mixture would begin. Its temperature would thus be raised above that of the enclosure, and the rate of combination would be rapidly accelerated until explosive combustion occurred. It is thus apparent that there are two sets of conditions under which combustion may occur homogeneously in a gaseous mixture—at temperatures below the ignition point slowly and without flame, and at temperatures above the ignition point rapidly and with flame. Suppose, however, that the mixture be maintained in an enclosure whose temperature is somewhat below that at which the gases begin to combine homogeneously with appreciable velocity—let us say, at a temperature of about 450° C.—and there be brought into the system some porous solid material at the same temperature, so that a large surface is exposed to the mixture. The gases in the layer immediately in contact with the hot surface will begin to combine rapidly; steam, the product, will be diffused outwards from the surface; and the supplies of hydrogen and oxygen at the surface will be renewed by diffusion inward. Thus combination proceeds heterogeneously at the surface till the transformation of the original electrolytic gas into steam is complete. This accelerated heterogeneous surface combustion may, in the case of electrolytic gas, be demonstrated by simple experiment.

We have here, said Professor Bone, pointing to a large apparatus on the lecture table, a furnace in which two glass tubes—one empty and the other packed with fragments of ordinary fire-brick—are being maintained at a constant temperature of 420° C.; each tube is separately connected with one of two vertical manometers which are arranged side by side against a graduated scale. The tubes having just previously been evacuated by means of an air-pump, we will now introduce electrolytic gas from a holder into each simultaneously till both are filled at atmospheric pressure. Connection between the two tubes will next be broken, leaving each of them independently connected with its own manometer. As combination proceeds in the packed tube—*i.e.*, in contact with the fire-brick surface, steam will be produced, and passing outwards will be condensed in the cold part of the apparatus outside the furnace, thus producing a partial vacuum, which will be indicated by a rising of the mercury in the manometer connected with the tube. On the other hand, no combination of the gases will occur in the unpacked tube, and therefore there will be no movement of the mercury in the manometer connected with it. [As the lecture proceeded, Professor Bone repeatedly called attention to the continuous rising of the mercury of the manometer connected with the tube containing the fragments of fire-brick, which by the end of the lecture had become nearly vacuous; on the other hand, there was no movement at all of the mercury in the manometer connected with the unpacked tube.]

Flameless surface combustion was first of all discovered by Sir Humphry Davy in 1816, during his memorable researches on flame. In his experiments on the ignition of explosive gaseous mixtures, he had found that slow combustion occurs at temperatures below the actual ignition point. He was thereupon led to ask himself the question, "Whether, seeing that the temperatures of flames far exceed those at which solids become incandescent, a metallic wire can be maintained at incandescence by a slow combination of two gases without actual flame?" Davy immediately

tried an experiment, which may now, remarked the lecturer, be repeated in modified form. Professor Bone introduced a warm platinum wire into a mixture of coal gas and air passing up a vertical glass tube. The wire became red hot, and remained so in consequence of the flameless combustion of the gases at its surface. The experiment was shown a little more conclusively in modified form with a Méker gas-burner, above which was placed a platinum crucible. The crucible was warmed up for a few seconds after which the flame was extinguished. On again turning on the explosive mixture, the gases combined without flame in contact with the heated surface of the platinum with a rapidity sufficient to keep the metal incandescent. In subsequent experiments, Davy proved that hydrogen is more susceptible to surface combustion than either ethylene or carbon monoxide, and that, while several metals have the power of inducing surface combustion, those of the platinum group cause it in an eminent degree.

Seven years later, the subject was systematically examined by Dulong and Thénard, who proved that all solid bodies possess the power of accelerating combustion, below ignition point, in varying degrees according to their specific characters and porosities. At this early period, chemists were curious as to the causes of surface combustion. Döbereiner in 1823 theorized upon the question, and he was followed by Fusinieri in 1825. In the same year, proof was given by William Henry, and confirmed four years later by Thomas Graham, of the fact that, in contact with platinum, hydrogen is burnt preferentially to hydrocarbons in a defective supply of oxygen, which is the opposite to what is now known to occur in ordinary explosive combustion.

The mechanism of surface combustion formed the subject of controversy between Faraday and De la Rive in 1834-5. De la Rive held the view that surface combustion consists essentially of a series of rapidly alternating oxidations and reductions of catalising material; Faraday contended that the function of the solid is to condense both the oxygen and the combustible gas at the surface, thus producing a condition in the surface layer comparable to that of high pressure. For a time this controversy excited great interest, but there was lacking crucial experimental evidence. Soon afterwards the subject of surface combustion completely disappeared from scientific literature for a period of nearly sixty years.

The question may now be asked, Does the undoubted accelerating influence of surfaces at temperatures below the ignition points extend to higher temperatures? In other words, Is it possible to accelerate the combination of combustible gases and oxygen by contact with an incandescent surface so as to obtain flameless combustion at temperatures much higher than the ignition point of the mixture? "I," said Professor Bone, "hope to convince you that such is possible." The result would be a more intensive combustion at the surface of a hot solid, which, if composed of a sufficiently refractory material, might be raised to a high degree of incandescence, whereby a large proportion of the potential energy of the gaseous mixture would be converted into radiant energy. The lecturer then proceeded to show that, if a combustible mixture of coal gas and air be injected at a sufficient velocity on to an already incandescent solid surface, the gases will combine at the surface without flame. This he did experimentally by injecting a highly explosive mixture of coal gas and air first of all on to a red-hot nickel gauze, afterwards on to incandescent fire-clay, and finally on to asbestos.

Professor Bone then considered the conditions prevailing in ordinary flames when electrolytic gas is ignited near the open end of a tube. He showed that combustion in an ordinary flame is in reality a slow process, and that there is ample margin for the quickening of combustion. The introduction of an incandescent solid not only accelerates combustion, but it also concentrates it at the surface, so that, for all practical purposes, the flame may be considered as non-existent. There is another point to be considered in heating operations—namely, that the energy shall be conveyed to the body to be heated in, as largely as possible, a radiant form. The direct radiation from ordinary flames represents a very small proportion of the energy liberated by the combustion. According to Professor Callendar's recent experiments, the total radiation from a Méker burner represents between 10 and 17 per cent. of the total energy liberated in the flame; but if for the ordinary flame there be substituted an intensive combustion at the surface of an incandescent solid, a very high radiant effect may be produced.

In this connection, it is a singular fact that Frederick Siemens, who was the first to impress upon technologists the importance of radiation in furnace operations, never realized in this connection the great possibilities of surface combustion. On the contrary, he taught that hot surfaces, by promoting dissociation, must hinder combustion—an entire misconception of the action of a catalyst. In view of this dictum and the great influence of Siemens, it is hardly to be wondered at that technologists generally have ignored or even ridiculed surface combustion. The next illustrating experiment was one recently devised by Professor Bone, in conjunction with Mr. C. D. M'Court. A diaphragm of porous refractory material was shown, through which Professor Bone said he could blow quite easily. Through this diaphragm a mixture of coal gas with sufficient air for its complete combustion was passed at a pressure of ¼ inch water gauge. Behind the diaphragm was a chamber, through which the mixture was fed. The gaseous mixture, percolating the diaphragm, was burned on the surface of the diaphragm, raising it to a state of vivid incandescence, and without any production of flame whatever. A large amount of gas could, the lecturer said, be passed through this, and the combustion proceed without flame, producing a large radiating effect. They could pass through the diaphragm (which was about 1 square foot in area) some 25 cubic feet of gas per hour, mixed with six times its volume of air.

In passing on to discuss some of the results of recent investigations upon the causes of surface combustion, the lecturer confined himself principally to experiments which have been made upon mixtures of oxygen and hydrogen and of oxygen and carbon monoxide in contact with various surfaces below the ignition points of the mixtures. It will, he remarked, be generally agreed that the best way of investigating this process of surface combustion is to determine the rates of combination of different gases with oxygen when the reacting mixtures are brought into contact with various solid surfaces at selected constant temperatures, and under conditions capable of control. This has been the line of attack usually adopted in recent investigations; but in order that it may lead to results of any real value, the temperature selected must be low enough to prevent the masking of the effects of surface combustion proper by changes in the main body of the gases not in contact with the surfaces. Then was shown on the screen the form of circulation apparatus that had been used in the investigations. The apparatus was described in detail from the combustion tube packed with the solid material—may be in the case of metals, the gauze of the metal, or in the case of solids, broken lumps packed throughout the tube from end to end. This is maintained at a constant temperature in the furnace. The closed circuit in which the combining mixture is circulated at a constant rate, the Sprengel pump, the manometer, and the various other details showing the completeness of the apparatus, were next fully described.

When considering the results of such velocity measurements, the lecturer remarked, it must be realized that, in surface combustion, we are dealing not with a homogeneous system in which the velocity of the chemical change would depend on the order of the reaction, but with a heterogeneous system, in which combustion is taking place only in the layers in contact with the surface, and in which quite different factors are operative. This being so, we must consider the separate influences of certain factors. First, there is the actual rate of combination at the surface, which is probably infinitely great in comparison with all other factors. In the second place, there are the rates of diffusion of the gases—the diffusion inwards of the combustible gas and of the oxygen on to the surface, and also the rate at which the reaction product is removed from the surface. In the third place, we must consider the rate at which possibly one or other, or maybe both, of the reacting gases are rendered active by the surface, assuming the surface acts in some such way. Then, in the fourth place, must be considered any change in the physical texture of the surface itself. Fifthly, there was the possible formation of inert films of gas at the surface which would have a hindering effect on the combustion.

Having thus shown the wide scope of the contributory factors, Professor Bone mentioned that some years ago Nernst advanced the general theory of chemical reactions in heterogeneous systems based on measurements of the rates of the solution of salts in water. In extending his theory to the special case of surface combustion, Nernst had ignored the possible activation of the combining gases by the surface, maintaining that the velocities of surface combustion would be governed entirely by diffusion factors—that is to say, by the rates at which one or other of the gases in the mixture would diffuse on the surface. According to the lecturer's own investigations, other factors usually predominate.

The lecturer then described the experiments which have been carried out by himself and his assistants (Messrs. R. V. Wheeler, G. W. Andrew, A. Forshaw, and H. Hartley) since 1902 on surface combustion of hydrogen and of carbon monoxide. A very large number of surfaces had been examined—porous porcelain, fireclay magnesia, platinum, gold, silver, copper, nickel, ferric oxide, nickel oxide, and copper oxide. The more salient effects were shown by a series of lantern slides. In the first place it had been found that when the gases hydrogen and oxygen or carbon monoxide and oxygen are circulated over a hot surface in their combining proportions, the rate of combination is always proportionately to the first power of the pressure of the gas in the apparatus. Secondly, when the gases are not present in their combining proportions, the rate of combination in nearly all depends on the partial pressure of the combustible gas. A little later it was shown that previous treatment of the surface by the combustible gas at the temperature at which the subsequent surface combustion takes place, has a very remarkable stimulating effect upon the catalyzing power of the surface. With new surfaces, the catalyzing power will, over several experiments, increase slowly up to a steady maximum; this maximum representing the normal condition of the surface. The surface might be stimulated beyond its normal degree of activity by special treatment, such as had been mentioned. The conclusion has been forced upon Professor Bone that the surface has itself some "activating" action upon the combustible gas. "The precise nature of this activation I need not discuss," he remarked, "but we are arriving at a definite conclusion concerning it. I do not, however, want to commit myself to any view at the present juncture. We will call it 'activation' without assuming in what sense the gas is being activated." The "activation" of the combustible gas proceeds much more slowly than its diffusion on to the surface; and therefore the controlling factor is really the rate at which the gas is being "activated" by the hot surface.

To show that the gases really penetrate the surface during surface combustion, photo-micrographs were shown of a piece of silver gauze used in the experiments. The first photograph exhibited the surface in its original condition with the strands perfectly smooth and highly polished. The second photograph showed the condition of the surface after exposure for some weeks to the combining gases (hydrogen and oxygen). Instead of its original smoothness and polish, it had acquired a beautiful frosted appearance. This indicates very clearly the way in which gas may act upon a surface of metal during surface combustion.

The next part of the lecture dealt with investigations as to the effect of moisture on the surface combustion of carbon monoxide. Some years ago Professor Harold B. Dixon showed that the presence of moisture is essential to the combustion of carbon monoxide in ordinary flames and explosives. In the present investigations, experiments had been made to ascertain whether a moist mixture of carbon monoxide and oxygen would combine over a fireclay surface with the same velocity as a perfectly dry mixture. When the dry mixture was circulated over the surface, the rate of combination was double that which was observed in the case of a moist mixture. In short, it has been shown by the experiments that, if moisture be added to the system, the rate of combination is immediately lowered; but by drying the mixture again, it is at once restored to double value. This probably means that water vapour is strongly attracted to the solid surface, and by forming a protecting layer at the surface hinders the catalytic combustion of the gases. The final words of the lecturer were directed to the question of the electrical condition of surfaces during combustion.

As already remarked, Professor Bone's second lecture (next Thursday) will deal with "Incandescent Surface Combustion, and its Industrial Applications."

DR. PERCY FRANKLAND ON WATER STORAGE.

In the "Journal" for March 7 (p. 663), reference was made to a lecture on "The Bacteriology of Water," delivered by Dr. Percy Frankland, F.R.S., to the members of the Birmingham Section of the Society of Chemical Industry. The lecture is published in full in the current number of the Society's "Journal;" and those of our readers who are interested in the subject will find it to be a valuable addition to its literature. The author has been identified with it for something like thirty years; and therefore any remarks from him command attention. Much has been said of late about the value of storage in the purification of water, as shown by the researches of Dr. A. C. Houston, the Director of Water Examination of the Metropolitan Water Board. But it may be mentioned, in justice to Dr. Frankland, that in 1886, as shown by a paper appearing in the "Transactions" of the Institution of Civil Engineers for that year, he had already called attention to the great importance of storage from a theoretical standpoint. Again, during the year 1892, he gave, in evidence before Lord Balfour of Burleigh's Commission on the Metropolitan Water Supply, the results he had obtained at several of the works of the London Water Companies, illustrating the influence of storage on the bacteriological purity of river waters abstracted for supply, and showed that there is a striking reduction in the number of suspended micro-organisms during storage in large reservoirs, The great importance of storage, from the hygienic point of view, was further manifest from experiments made on the fate of pathogenic bacteria introduced into natural waters, which showed that the duration of life of these bacteria under such conditions is generally very short. In Dr. Houston's report on his examination of London waters for the twelve months ended March 31, 1910, the numerous advantages secured by the storage of surface waters are set forth; one being that "the use of stored water enables a constant check to be maintained on the safety of London's water antecedent to, and irrespective of, filtration." Dr. Frankland, who came to much the same conclusion a quarter-of-a-century before, fully endorses Dr. Houston's remarks. He says that his "catalogue of the virtues of storage" reads not unlike an advertisement; but he considers it is quite excusable, "in view of the extreme difficulty of making any impression on the British public in scientific matters, however important." Dr. Frankland's opinions were unfortunately expressed in the days of the much-abused Water Companies, and were buried in the pages of the "Transactions" of the learned societies. If he had only had the facility for publicity so freely afforded by the modern half-penny daily paper, his utterances would no doubt have received much greater attention.

Midland Junior Gas Engineering Association.—Next Saturday the members of the Association will have a busy day at Burton-upon-Trent, where they will visit the famous brewery of Messrs. Bass, Ratcliff, and Gretton, Limited, in the morning, and the gas-works (under the guidance of their President, Mr. R. S. Ramsden) in the afternoon. After inspecting the gas and electricity works, they will take tea at the White Hart Hotel, on the invitation of the Burton-upon-Trent Gas and Electricity Committee. This is a visit which the members have been keenly looking forward to.

"OVERLAND" SUPPLIES OF COKE-OVEN GAS TO TOWNS IN THE RHENISH AND WESTPHALIAN INDUSTRIAL DISTRICTS.

[Communicated.]

The extensive scheme, far-reaching in its effects, for the supply of coke-oven gas throughout the Rhenish-Westphalian industrial districts has already, to a certain extent, been put into actual operation, and, during the last few years, it has naturally been dealt with very fully, on many occasions, by the German Press. Nevertheless, it appears to the writer of these few notes that one of the most vital points of the whole question has never as yet been referred to.

A very small percentage, indeed, of those who have read the articles on the subject in the papers can have formed any idea as to what really is the main product of a gas-works in point of quantity; and they will be astonished to hear that it is not gas, but coke, which occupies the first place. Of every ton of coal used on a gas-works, only about 3 cwt. are sold in the form of gas, while no less than 11 cwt. are sold in the form of coke. Gas coke is manufactured in the best possible manner on a gas-works; it is loaded into vehicles from very suitably constructed overhead hoppers at a minimum of cost and labour; and it is placed at the disposal of the public at a low price. This relatively low price is in no way due to the solicitude of the gas undertakings for the public welfare, but is the logical consequence of the actual condition of affairs; for gas-works cannot, unfortunately, only put on the market the quantity of coke required, but are bound to produce the quantity of coke proportionate to their gas production. As, however, the production of gas increases, as a rule, at a more rapid rate than the population, the natural consequence is that the supply of coke is fully, if not more than, equal to the demand, and that the prices remain moderate.

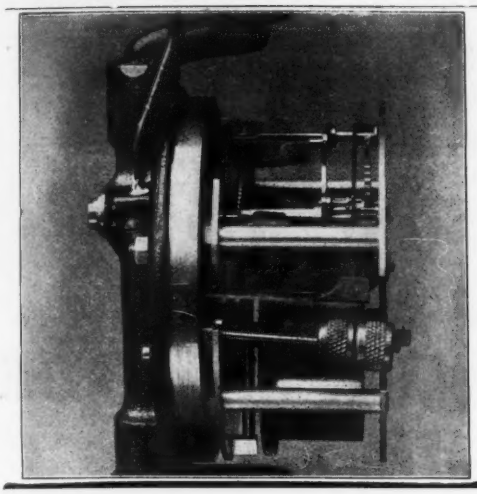
Now, what is going to happen if all, or the majority of, the municipal gas-works in the Rhenish-Westphalian industrial districts are shut down? The production of gas coke in the towns will cease entirely; and its place will have to be taken by metallurgical coke. Now, even at present, the latter product, which possesses a heating value which is only about 5 per cent. greater than gas coke, is frequently some 30 per cent. dearer than gas coke. This is only natural, seeing that the production of metallurgical coke can be regulated according to the market requirements—if prices fall, the production is simply reduced. If, therefore (and this is the *crux* of the whole matter), the supply of coke-oven gas were introduced to any considerable extent, the coal mines would secure the monopoly of supply not only for the gas but for the coke also.

Let us take a concrete example—a town, for instance, with a gas consumption of 30 million cubic metres per annum, carbonizing 100,000 tons of coal and producing about 55,000 tons of gas coke for disposal to the inhabitants. Now, if gas coke is replaced by metallurgical coke at a price of (say) 5 marks per ton more, the inhabitants would have to pay 55,000 times 5 marks, or 275,000 marks per annum more for their coke. In other words, they would be worse off, as compared with the time when they had a coal-gas works, by $\frac{275,000}{30,000,000}$ or an equivalent of $\frac{9}{10}$ pf. (nearly a penny) per cubic metre.

These considerations also throw an interesting light upon the general economic reasons which the astute promoters of coke-oven gas schemes have dangled before the eyes of the public. It is a well-known fact that nothing is more effective in Germany than an idealistic platitude; and this may explain how the electrical industry has, with wonderful dexterity, succeeded in convincing the public that the use of electric current and a high state of civilization are synonymous. To judge from what the public are being told, the Athenians at the time of Pericles, and the Florentines under the Medici, were barbarians; and the consumption of soap, gas, and electric current, and that alone, is the sole criterion of the progress of civilization!

Now the collieries are following in the steps of the leaders of the electrical industry, and are maintaining that it is an economic duty to employ in the towns the large quantities of superfluous coke-oven gas which they produce. That this is an absolutely false conclusion is obvious from the foregoing remarks in regard to coke; for if metallurgical coke is substituted for gas coke, it will be necessary to produce an additional quantity of metallurgical coke corresponding exactly to the quantity of gas produced, so that there will remain precisely the same quantity of superfluous gas produced from the coke-ovens, which cannot be made use of.

This question of the supply of coke-oven gas proves, therefore, to be—not a scheme which will lead to a general saving, benefiting the community at large, but a carefully and logically planned attempt on the part of the collieries to secure the monopoly for both gas and coke in the Rhine Provinces and in Westphalia. One can only say to the authorities of those towns who have to decide whether they will avail themselves of the supply of coke-oven gas: "Timeo Danaos et dona ferentes."



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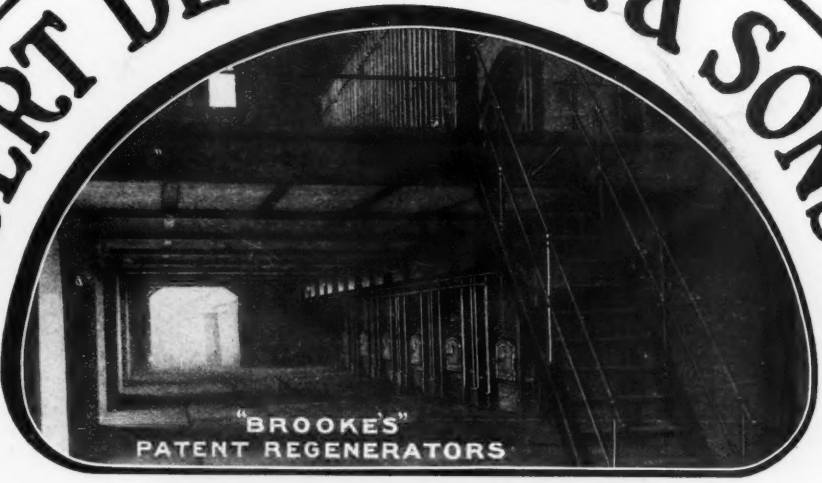

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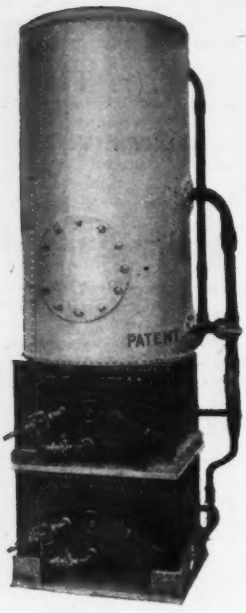

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LABOUR CO-PARTNERSHIP ASSOCIATION.

Mr. CORBET WOODALL'S PRESIDENTIAL ADDRESS.

The Annual Meeting of the Labour Co-Partnership Association was on this occasion of even more than usual interest to the gas industry, owing to the fact that the President for the year was Mr. CORBET WOODALL, the Governor of the Gaslight and Coke Company. The gathering (which was the twenty-fifth annual one of the Association) took place last Thursday afternoon in the theatre of the Institution of Civil Engineers, Great George Street; and among the crowded audience, there were to be seen quite a large number of gas men. The meeting was full of interest to all those connected with the co-partnership movement; but our notice of the general proceedings is necessarily confined to those points which more closely apply (so far as such a selection is possible) to the branches of industry with which the "JOURNAL" is associated. The first item on the programme was the following

PRESIDENT'S ANNUAL ADDRESS.

Before entering on the business proper of this meeting, I desire to express my satisfaction, and that of the Committee, that we are able to assemble in this theatre. When I was asked to suggest a place, the Institution of Civil Engineers at once occurred to me; but I felt some doubt as to whether the Council would recognize in the work of our Association sufficient kinship with that of civil engineers to justify them in receiving us. They have done so; and we are all very grateful to them for their hospitality.

To suggest and advance systems designed to promote industrial harmony and peace is the noble aim of the Association; and from the success of such aims no body of men stand to gain more than the great industries and undertakings whose representatives form the membership of the Institution of Civil Engineers. No technical association or institution represents a tithe of the number of employees directed by the civil engineers. Though their home is here, their works are being prosecuted the world round, and give employment to peoples of every country and every race. The docks, railways, roads, rivers, and canals; the services of water, gas, and electricity; the sanitary works by which the health of communities gathered in great cities is secured—these are some of the works for which the civil engineer is responsible, and upon which, whether in construction or in administration, vast armies of workers are employed. All are now necessary for the convenience, trade, and general well-being of the community; and the cessation of the enjoyment of any, even for a short period, causes widespread inconvenience and national loss. For these reasons, I think that this Association, seeking as it does to foster such relations between employers and employed as will minimize or remove causes of friction and consequent inconvenience, loss, and suffering, is appropriately gathered under this roof to-day.

It is a remarkable truth that the seeker after light and guidance in the labyrinth of the relations of Capital and Labour, or of employers and employed—to use a more humane expression—can find little to his surprise in the classics of the science of political economy. The thinkers who deduced the principles of commerce from the dealings of individuals in trade, performed a service of immense value to the world; and people who carry on business undertakings, or embark on industrial enterprises, without having regard to the proved generalizations of economic science, run great risks of disaster from the intrusion into their calculations of some well-charted hostile truism. Political economy is no more than a compendium of theories framed from more or less accurate and discriminating observation of the ways of trade.

In no department of their study have the classical writers upon economics so signally failed as in regard to the sources of industrial and commercial profits. That the gains of trade are derived in the first place from buying cheap and selling dear, is an elementary proposition the truth of which should not blind us to other factors of the problem of successful commerce. Granting that in a simple society the trader who buys at the lowest price and sells at the highest will rank as the most successful dealer, it is equally true that, as the community grows complex in composition and in its necessities, the operation known to economists as "the higgling of the market," whereby they conceive exchange values to be ascertained, recedes into the background. An element of trustworthiness and trustfulness appears. Mutual satisfaction becomes the ideal of systematic trading; and it is in the realization to a considerable degree of this ideal that modern commerce, wholesale and retail, differs most from the old, which accepted the maxim "*Caveat emptor*," as its rule. The existence of our great London "Stores" depends upon nothing else than this new principle in trade.

You will find little suggestion of the possibility of such a form of trade in the text-books of political economy, which is a strong argument for the incompleteness of the science. The phenomenon of the "Stores"—as commercial, not as co operative establishments—indicates that the public appreciates fair dealing. The ancient order of retail shopkeeping, to which the rules of the fixed price and cash payments were almost unknown, was first broken up by the innovation of the Co-Operative Stores, originally under amateur management, and carried on without capital. The old-fashioned shopkeepers protested bitterly. Forty years ago, the question of the stores *versus* the shops was an important factor in domestic politics which terribly vexed public men. It threatened the seats of Members of Parliament; but in course of time, it settled itself. Capital, commanding skilled management, found employment in serving the public on the new lines; and thus a fresh economical development appeared, which earned good dividends where small retailers had scarcely been able to make both ends meet, and sold at cheaper rates, without necessarily sweating the employees. If that man is a public benefactor who has made two blades of grass grow where only one grew before, the business men who so successfully cultivate a system of trade which redounds greatly to the advantage of both sellers and buyers are entitled to the same recognition.

The sources of the profit of industry are not dissimilar from those of commerce, with which it is so closely connected. Here, also, at first the simple rule of buying cheap and selling dear prevailed. The master-worker wanted his raw material as cheap as he could get it; and he hired his labour on the same principle. I fear it cannot be denied that the so-called Manchester School of Economics firmly believed in cheap labour as essential to cheap production. Cheap capital, cheap material, cheap labour, and cheap distribution, constituted the planks of the Manchester platform.

By treating human labour as a chattel, these economists incurred the reproach of setting the rights of capital above the claims of humanity. They failed, as a school of thinkers, to perceive the danger hidden under the conversion of the individual position of the employer into the impersonal relation of the capitalist—a change which was favoured by the rise of the joint-stock system upon the industrial horizon. The individual master disappeared; and the erstwhile servant was classified as a producer. This is a useful classification, for many purposes, if it is kept within right bounds; but political economy sixty years ago pushed the conception too far.

Human nature cannot be driven out of a man by calling him by something he does, not remembering what he is. So when the systematizers created economic man more or less in their own image, natural man responded by destroying their machines at home, while abroad he stuck to his unscientific ideal of nationality. The British Factory and Truck Acts, and in particular the revived Trade Unions, set other artificial bounds to the cheapening of labour by the play of competition. Labour asserted, and in many ways made good, a claim to a brighter lot than the unrestricted operation of economic forces seemed to offer. The Saturday half-holiday was won. Sunday work was reduced to what is necessary to the public service of security and recreation.

Thus we are led to see in the modern Labour movement primarily a revolt against the attempted classification of human flesh and blood with cheap raw material or fuel, as a contributory to the supposed need of capital in the way of profitable employment. The attempt was an error, even as economics, as riper experience has abundantly demonstrated. Meanwhile, labour organized for its own deliverance. So we have Trade Unions, with their original programme of a fair minimum wage, and collective bargaining for rates of wages and hours of labour. Nobody could possibly object to this defensive action on the part of the wage-earner; and so long as his Trade Union is informed with right and reasonable ideas, I for one would no more question its right to be heard upon Labour questions than I should dispute the legitimate custom of a learned profession. It is different when the Trade Union, in turn, pursues a false ideal. If a place in the industrial world is allowed to Trade Unions, it does not follow that we must bow before them in regard to everything. The shortcoming of the existing order of such societies appears when they seek to enlarge their proper function, and commit themselves to declarations of policy and projects, sometimes aggressive, sometimes reactionary, but usually conceived on narrow class lines. I find, for example, an uncontradicted report in the Press that one Trade Union has recently decided to prohibit their members from working under a co-partnery system unless operatives own the bulk of the property. Yet any employer who, for reasons of his own, might refuse to give work to a member of the same Society, would be denounced as a tyrant.

Another mistake which, in my judgment, Trade Unions make is in pinning their official faith to a future of Socialism, or Communism, or Syndicalism—or whatever may be the proper word for the moment. I know and entertain the greatest respect for many Labour leaders, whose perfect sincerity no one can question, and whose intellectual powers and force of character, as proved by their rise from a big crowd of rivals, command admiration. It is a marvel to me that so many of them should profess themselves Socialists, and look on the practical negation of individual merit as the goal of Trade Unionism and the crown of civilization.

Apart from its present ideals, Trade Unionism fails as a system of morals by reason of its negative character. It wants inducement to improvement of the man, and of the fruit of his toil. It so far resembles Socialism in being frankly materialistic. It conveys no appeal to the soul of man, who has never yet remained satisfied with bread alone, or even with food and games. The spirit of man never will lie bound for long in a self-centred materialism, or the outlook for humanity would be black indeed. The hope for man lies in his power of self-sacrifice. With the inconsistency which is so human, man will play in company with his fellows at being a Communist, but he will die for his country all the same. So will the miner risk life and limb to save another, possibly a worse man than himself.

Why must daily toil be destitute of the same light? The ideas of duty to be done, of interest to be felt, of progress to be won, ought ever to be bound up with the obligation of the livelihood to be earned. The problem before us, who perceive the need, is to find the way; or rather, as we hold, having found it, to lead others therein. Co-partnership is its name; and I heartily believe, not only that it is the right way, but that at least at present it is also the only way, and that the time is favourable to its larger use. I think it cannot be gainsaid that the world is ready for another step onward and upward in social development; and it is equally evident that capital is growing weary of wages settlements that do not settle anything, and of bargains that bear no more strain than wet paper. To arbitrations and conciliations there is no end; and wages agreements are not worth the making, because the parties are not in substantial accord. It is a good saying that "Nothing is ever settled until it is settled right;" and the fact must be admitted all round. It is hopeless to think of finality in connection with an arrangement between parties, of whom one refuses to the other the right to exist and to exist decently.

Therefore, we must start from a just recognition of inherent and respective rights, the measure of which we may perhaps agree to treat provisionally as an open question. It must be understood that all the contributories to profitable production are to share in the gains, and so far as may be possible in the losses. Only thus can the pernicious convention of regarding employers and employed as natural enemies be eradicated. The ideal is that every industry and every firm shall be united in the pursuit of its own corporate welfare. The realization may come by steps. Every employer who gives his staff a bonus after a successful year's trade, thereby endorses the principle; and there are hopes for him and his people.

I have said that to establish relations between employers and employed of a more stable and equitable character, and to eliminate strife, is the aim of this Association; but the success of the effort will mean more than this. By making the employees partners, and especially by providing means of ready and profitable investment of their savings, encouragement is given to thrift, and the prospect before the workers is both enlarged and brightened. Responsibility brings with it a strength of its own. It is a quickening force in any and every aspect of life; and co-partnership will, as the years pass, bring the sense of responsibility. Possession, too, the result of thrift, improves a man in his own esteem; and these forces react to the help of each other. There is a joy in possession; and Shakespeare well illustrates the fact when Touchstone speaks of Audrey (an ill-favoured thing) as "Mine own."

I do not labour under the illusion that co-partnership is competent to create a new heaven and a new earth; but I am convinced that it can make the old world brighter for many. It is true that its prime attraction is of a material nature; but I also see in it something more, that is spiritual. It lays the foundation for the uprearing of a new form of industrial goodwill—namely, the personal interest of the worker in his employment, which constitutes an additional asset of the industrial commonwealth. The late Sir George Livesey, whose name is to be for ever honoured in this connection, would relate how that he once inquired of another large employer of labour whether a workman with a real interest in saving time and materials and stopping waste might not be worth an extra 5 per cent. on his wages. "Say 20 per cent.," was the answer. That is the immediate point. But there is more behind. No man can exercise care and fidelity, any more than he can be painstaking or make sacrifice, without experiencing the reaction of affection for the object of his devotion.

The soldier, broken in his country's wars, loves the flag the more for all that he has given to it. So I trust that every gratuitous thought, every unwonted aspiration for its increase of prosperity, that the co-partner gives to his employment, may redound to his individual advantage by helping to make him a wiser man and a better citizen. There is that in the idea of co-partnership, as I hold also in service in the defensive army, which is capable of touching the imagination, and thus awakening the noblest part of a man. Those who feel this influence will think of others as well as of themselves; and just as the cricketer or the member of a football team strives for the glory of his side, so the good co-partner will realize that he is a part of a whole that is greater than himself. I fail to appreciate the criticism of this system which dwells upon the limitation of individual powers, insisting that the effect which a single clerk or mechanic is able to exert upon the welfare of his firm is small to insignificance. Milton says, with a truer insight—

"They also serve who only stand and wait."

If every man in his place does his best, all must benefit.

I have dealt with one aspect of the work of our Association at some length, because it is that which has appealed most to me in relation to my own life and work. But that which attracts most the great number of those who desire to see an improvement in the happiness and status of working men, is probably co-partnership housing. I hope that Mr. Vivian will to-day tell us something about the great work which he is so ably directing. When one sees the conditions under which large numbers of decent respectable people are compelled to live not only in towns, alas, but also in many country villages, it is difficult to be hopeful. Large families living in two rooms, or even in single rooms—how is it possible that the decencies of life can be observed? Think of the care with which the children you know are watched over, the quiet of the nursery in which they are put to sleep; and think of the parallel conditions of the children of the decent poor of our towns. Much has been done in recent years. Cheap train fares have widened the field and enabled working men to have their houses where at least the air is fresher than in the slums; but very much remains to be done. At present, I gather, the movement has not dealt with the problem of housing the very poor; but I hope that before long a practicable scheme for these also will be devised on co-partnership lines.

It is a source of infinite satisfaction to me, whose life-work has been almost wholly occupied in the gas industry, that this industry, especially in London and the suburbs, now exhibits some of the largest examples of co-partnership. The London and Suburban Gas Companies lead their world in this respect; and the cause is spreading year by year. It is true that the conditions here are exceptionally favourable to the system. Gas companies' accounts are open to the public. British gas stock is purchasable at auction in the case of new issues; and the consumers are already partners in the gains of the business, however earned. They participate largely in the benefit of favourable markets for the raw materials of gas manufacture and for the residuals. A gas consumer who has nothing to do with the prudent buying of coal and oil, and may never purchase a bag of coke, yet takes the lion's share of the profits thus derived. It is only after giving the consumers their share, in the form of a reduction in the price of gas, that the proprietors can divide their portion. The machinery of the sliding-scale of selling price and dividend being already installed, it is comparatively easy, given the will, to adapt the same arrangement to provide the share of the employees under a co-partnership scheme. Such has already been accomplished by twenty-six gas companies in the United Kingdom, of which the largest, the Gaslight and Coke Company, now have upwards of 9000 co-partners; and the South Metropolitan Gas Company, the pioneer undertaking, showed at the close of the last account year that over £450,000 had been paid to the credit of the co-partners. On the other hand, some of the Provincial gas undertakings that have adopted the system are of quite modest proportions. Municipal undertakings lack some of the facilities of gas companies; but the principle is quite possible of adoption by them also. We must all greatly desire to see the benefits of co-partnership extended to other great national industries and services.

Two years ago, Mr. Balfour expressed a hope that the principle of co-partnership might be applied to agriculture. To use his own words: "Those people who are working on the land without being owners of that land—the agricultural labourers—can they be brought in conjunction with the aims and objects of this Society, into some closer association with the industry of which they are the prop and stay?" An article in "The Times" of March 13 furnishes an answer to this query of a most satisfactory character, showing, as it does, that the principle has received the fullest application on the Essex estates of Lord Rayleigh. The writer of the article says: "In Mr. Strutt's hands, co-partnership seems to have led to more willing service, to a greater readiness to accept new methods, and—on the part of some of the men, at least—to a greater interest in their work. This fact has made its impression in the district; and it is probable that other agriculturists will shortly be trying co-partnership.

I do not venture to offer an opinion upon the interesting question of what other private firms might find it equally worth their while to follow the lead of Messrs. Lever Bros., of Port Sunlight, Wm. Thomson and Sons, of Huddersfield, and Messrs. Taylor, of Batley—not to speak of the fairly large number of co-partnership businesses established by working-men at Kettering, Leicester, and elsewhere, of which my successor, Mr. Amos Mann, will be so competent to speak when he addresses you as President next year. I am more concerned with the case of the great organized statutory industries of supply and transport; and I should rejoice to see some movement in this direction (say) by the railway companies. By this means, it would appear that the latter might rid themselves of the creaking machinery of arbitration boards and the ministrations of the Board of Trade, earnest and valuable as these have been. Lord Robert Cecil not long ago observed that State aid in furthering such consummations might be made available, including perhaps some adjustments of company law. I am afraid it is hopeless to look for Government action in this direction; nor do I, for one, desire it. We are, perhaps, over-apt to invoke Parliament to enable us to do something which we could quite easily bring about ourselves, if we put our hearts into it; and the latter is the only way to advance co-partnership.

We are rejoicing at the present time in a sudden dramatic development of the idea of arbitral as opposed to military methods of determining disputes between nations. What the world has waited and longed for seems to be brought into the region of possibility, and that within a comparatively short period. What we pray for in the relations between nations, the "peace on earth and goodwill," we desire also among the citizens of our country, whatever their social station. This Association is labouring, wisely working, to secure community of interest and harmony in effort. Its success will make scenes such as those recently enacted in South Wales become a mere bad memory only. On these grounds, I think we must heartily wish it "God speed."

A Paper on Co-Partnership in Practice.

Mr. Henry Vivian (the Hon. Secretary) then presented a lengthy paper on "Co-Partnership in Practice," to the principal points of which he drew the attention of those present. A great

deal of information was given with reference to working-class co-partnership businesses; and then came a section headed "The Transformation of Capitalism."

In the course of this portion of the paper, the author remarked that one of the largest co-partnership developments through an ordinary company was in connection with the South Metropolitan Gas Company. The scheme was started in 1889; but its co-partnership character had been strengthened from time to time. The first step gave the employees, in addition to the wages and salaries customary in the occupation, a dividend amounting to ¾ per cent. on wages for each 1d. reduction in the price of gas below an agreed standard—namely, 3s. 1d. per 1000 cubic feet. Later on arrangements were made for encouraging the employees to capitalize in the stock of the Company, or leave, on deposit, the share of profit they received. The Company next obtained power from Parliament providing that, when the employees had not less than £40,000 (nominal value) in the Company's stock, they might elect representatives by ballot to the Board of Directors. Put in brief, the result to the end of June, 1910, was as follows: The employees had received as a share of the profits £505,675. They have invested in the share capital and deposits of the Company (held by 5000 employees) over £401,038. The amount divided for the year ended June, 1910, was £41,133. The employees had now three representatives, elected by the employee shareholders by ballot, on the Board, out of a total of nine.

The South Suburban (late the Crystal Palace) Gas Company were a much smaller Company; but they had adopted substantially the plan of the South Metropolitan Company. The scheme began in 1894. The employees had received £36,914 as their share of profit; and they held £36,069 of capital. They elected in 1907, for the first time, two Directors on the Board. The Commercial Gas Company's was a much younger scheme, having been started in 1901. The profits allotted to the employees to date amounted to £45,520, and over £49,164 had been invested in the Company's capital. Co-partnership principles had made great headway in the gas industry; the following Companies having adopted the principle since 1908: Leamington, Rugby, Croydon, Walker and Wallsend, Wrexham, Tunbridge Wells, Tottenham, Gloucester, Bournemouth, the Gaslight and Coke Company (London), Cardiff, and Wellingborough, until now there were 28 gas companies on this list. Up to the present time, about 19,613 employees were taking advantage of co-partnership schemes in gas companies, having a total capital of £47,130,073,* out of a total paid-up capital in gas companies in the United Kingdom of £86,500,000. These employees now held £600,776 in the stock of the various companies, and had had allocated to them during the last year £92,105. The total amount allocated to labour since the introduction of the schemes had been £726,126.

Details of schemes in operation in firms and companies in some other branches of industry followed; and the author in conclusion said: "The growth of co-partnership businesses organized by groups of workmen depends in the main upon the increase in the number of men in the ranks of workmen who, having business aptitude, are capable of taking a broad and public-spirited view of their duty towards their fellows. The number of such men will increase with the spread of education, but probably not very fast. The largest field for the extension of the principle must, of course, be in the great world of industry where capital exists and the task of building up a business connection has been accomplished, and much of the difficulty which confronts a workman's society just starting has been got over. In the case of established concerns, there are many ways of introducing co-partnership which seem to meet the conditions of a variety of businesses; and given the spirit of co-partnership, on the employers' and the workmen's side, a great extension should be possible."

A Suggestion for Municipalities—Gas Company Profit-Sharing in America.

The Committee's report for the past twelve months was a comprehensive document, which contained, among the many other matters dealt with (and in addition to the particulars of co-partnership and profit-sharing in British gas companies noticed elsewhere), the following two paragraphs.

The example of the gas companies of England in adopting the system of co-partnership with their workers, as well as the direct representation of the workers on the Board of Management practised by two English Companies is found also in America, for the Boston (Mass.) Consolidated Gas Company have arranged that their 700 profit-sharing employees shall have a representative on the Board of Directors. Considering the great success which has followed this arrangement, of having the employees represented on the Board of Management by one of themselves in the two cases in which it has been tried, it is curious that more gas companies should not yet have adopted it.

It seems to be thought that co-partnership is, and must be, confined to privately-owned companies, and is inapplicable to municipal gas-works. We do not ourselves put this limitation on the application of our principles; and we have recently had some inquiries from municipal officers, and hope to be able to report progress in this direction next year. In this connection, we note that the Coventry Electricity Department, in recognition of improved work, are granting a bonus of two weeks' pay to each employee—a proceeding which might easily form the commencement of a profit-sharing scheme.

* A table containing the latest figures concerning these companies will be found on p. 52 of this issue.—Ed. J.G.L.

Notes from the Speeches.

Mr. D. Lleufer Thomas proposed a resolution which was subsequently adopted in the following form: "That this meeting expresses its hearty approval of the principle of labour co-partnership, believing that its adoption would tend to harmonize the interests of Capital and Labour, increase industrial and commercial efficiency, and widen the ownership of property, to the advantage of the whole community." He remarked that he came from South Wales; and the events of the last few months had made him appreciate more than ever the principles of co-partnership. He was convinced the coal people should give consideration to the possibilities of applying the system in their industry.

Mr. George Thomson, Mayor of Huddersfield, in seconding, stated that his firm were in the twenty-fifth year of their scheme of co-partnership; and the harmoniousness of the working during the whole of this time had been one of the pleasures of his life. He had never had a general difference with the men; and in very few cases had a question arisen with regard to the individual conduct of his fellow-workers. He did not believe that, under the ordinary competitive system, he could have reached the position which he had attained under co-partnership.

Lord Robert Cecil, in supporting the resolution, said he did so with great confidence, because he had for very many years been convinced that the existing condition in this country of the relations between Capital and Labour was a very serious social danger. He was himself convinced that, unless some means could be found for appeasing the hostility which existed, and he feared was growing, between these two great interests, which ought to be absolutely in sympathy and friendship, great danger threatened the prosperity of the country. Under any circumstances, so far as he could see, the wages of labour must be settled, as all other prices were, by the law of supply and demand. He did not himself think that this law (which was, of course, merely the generalization of human experience) could possibly be set aside by any arrangement; but it was important for both sides—and particularly for labour—that it should work freely and fairly, and without any bias on one side or the other. At the present time, it did seem to him that there was a risk, at any rate, that the law would not work fairly; and even where it did work fairly, there was no security to the wage-earner that he was really being paid the wage to which he was entitled, and would be able to get if the law of supply and demand were freely and unbiassedly worked. He was convinced that there was profound suspicion among a large part of the working classes that this unfairness was often taking place; and as long as this feeling went on, it must produce that sense of hostility which was really fatal to the success of any industrial system. How was this to be remedied? He believed that the only possible way was by the adoption of co-partnership; and he was of this opinion, not only because co-partnership would secure the automatic increase of wages whenever there was an increase of profits, but also—and far more—because it would enable the worker to have a knowledge of, and a responsibility for, the management of the concern. To his mind, co-partnership was valuable from all points of view, but most of all because it was a great educative agency, and would enable everyone to understand that, in the great concerns of industry, they were all working for one end, and ought to be working in one army. In his opinion, if they could not by some such means as this solve the difficulties and problems that were before them, they themselves, perhaps, and certainly their children, would have bitter cause to regret the existence of such blindness and incapacity.

Mr. Charles Carpenter remarked that he could not sit there as a listener to what had been said without expressing, however imperfectly, his earnest belief in the resolution which had been proposed, and in the thoughtful words with which Lord Robert Cecil had supported it. He felt quite certain that Lord Robert was right when he said the existing state of affairs could not go on. He himself had been associated with working men since he was fifteen years of age. At that meeting some surprise had been expressed at the prevalence of Socialistic principles among the working classes; but his own surprise was that so many of the working classes existed to-day outside Socialism. He was quite sure that if at the present moment he was a working man, and there was no such thing as co-partnership, he should be an ardent Socialist. The remedy, as had been pointed out by different speakers, was in co-partnership. He had the privilege of being associated with the late Sir George Livesey for a large number of years, during which the South Metropolitan Gas Company's co-partnership scheme had been in operation; and he could thoroughly endorse everything that had been said in regard to it. As Mr. Thomson had said, he could say—they had not known through all this period what trouble was with their workmen. The Company had a large amount of skilled and unskilled labour, and had never had a difficulty arise. There was one aspect of co-partnership which might be new to some of them, and which he might mention. He had been told that the Company were losing a certain proportion of their best, most careful, and most thrifty men. The reason for this was that, having saved a sum of money, which the co-partnership system allowed them to do, they had realized their stock, and had gone with their wives and children to Canada mainly, to Australia, and to other of the Colonies of the Empire; and he had been asked whether anything could be done

to stem this loss of good men. His reply, however, had been that, on the contrary, he rejoiced in it. He was very pleased to think that the Colonies were being peopled with men and families from England who went there and settled, not as paupers, but as persons in possession of a reasonable sum of money. The Company had in the last two years lost between eighty and ninety good workers, who had gone and taken with them a sum of between £40 and £50 apiece. He ventured to think that this was a state of affairs to rejoice in rather than to regret. Then there was another matter he might be allowed to mention, and it had reference to railway companies. He knew that Sir George Livesey propounded a definite scheme of co-partnership applicable to one of the large railway companies; and he (the speaker) had had an opportunity of attending a meeting of practically the entire staff of another large one, who, with one accord, were strongly in favour of the application of the principle to their undertaking. But he supposed they were a conservative nation in this as in many other respects. Though the South Metropolitan Gas Company's scheme was in its twenty-second year, it was only within the last two years that their great neighbour across the water—the Gaslight and Coke Company—had adopted it. Taking all the facts into consideration, he did not think they need have any fear as to the ultimate success of co-partnership principles. He felt with regard to the working classes that the picture—regrettable though it might be—which Lord Robert Cecil had drawn was correct; and the reason for it was this—that the tendency would be, if something were not done to stem the tide, which was, he believed, strong, and was setting in the direction Lord Robert spoke of, for the management of the country to get into the hands of those not who were incompetent to manage it, but who were the least competent to do so. He meant the disaffected and discontented working classes. He believed that this tide could be stemmed by the adoption of co-partnership principles, and that by their application to the working classes a class as powerful as the middle class which existed to-day would be brought into being. That was to say, that these principles would do what nothing else would do to bind the whole of the people together. Just one other point. Sir George often said that the corner-stone was put to co-partnership by the workers having some voice in the management of the undertaking. The South Metropolitan Company had had Workmen Directors for the last fifteen years; and the objections to this course which were felt by many people at the outset had proved not to be realized. They had derived great benefit from the presence at their Board meeetings of these workmen, who were ever ready to voice the requirements of the employees. And in the Company's business, too, it brought them a great advantage; these Workmen Directors being in close touch with the people with whom a large proportion of the business was carried on—he meant the working-class users of gas. It was sometimes objected that the holding of the workmen was so small. But about a stone's throw away from that hall were the Houses of Parliament, in which they had, or they ought to have, the greatest of the country's business being carried on in the most efficient and competent manner; and there were there "working men directors," if he might say so, taking part in the councils of the Empire. If this was the right policy to adopt in carrying on the business of the country—and they knew that it was—he was sure it was so in connection with the carrying on of their industrial undertakings.

Mr. Frank Debenham said it had been his privilege to make the acquaintance of Sir George Livesey, who had thoroughly imbued his mind and stirred his feelings with this question of co-partnership. It was a great satisfaction to him to see Mr. Corbet Woodall presiding over so large a meeting that day.

Mr. Anuerin Williams (the Hon. Treasurer) proposed a vote of thanks to the President for his address, for his conduct in the chair, and for his services to the Association during his year of office. It was, he remarked, one of the greatest encouragements they had had when the great Gaslight and Coke Company took up the principle of co-partnership (following the example set by the late Sir George Livesey), and, further than this, when Mr. Corbet Woodall kindly agreed to become President of the Association for this year and give them the advantage of his name, which was so well known in the gas industry, to help to show the world that what they were preaching was practical wisdom which was adopted by practical men in connection with their businesses. He might sum up the President's address in a phrase—he had treated the worker as a human being, and not merely as a machine and a chattel. This was the key-note of all that he had said; and it was perhaps especially brought out where he spoke of the old fallacy of economists in regard to cheap labour. This fallacy was fortunately exploded a long time ago; but it was immensely injurious while it lasted. As to Socialism, the original meaning of this was that the greatest good of the greatest number could only be achieved by one and all directing their actions, not towards individual advantage, but towards the well-being of the body social of the whole community. True, the time arrived when the word seemed to take another meaning; but he thought the great mass of the people who called themselves Socialists to-day—at any rate, among the more educated—were beginning to go back to the old meaning.

Mr. F. Maddison, in seconding the vote, contended that there was only one definition of Socialism, and that was the economic one. If there was one part of Mr. Corbet Woodall's address that he liked more than another, it was where he used the word Socialism like a business man, and as they met with it in daily life. As to co-partnership, if a reform left a man with nothing more than he had before, it was no good to him—a man must get hold of something. Now, this movement taught the value of possession, not only for the individual, but likewise for the community.

The vote was carried with applause, and briefly acknowledged by the President, after which the Institution of Civil Engineers were thanked for allowing the Association to use their theatre for the meeting.

A PRACTICAL EXHIBIT

At the Agricultural Hall.

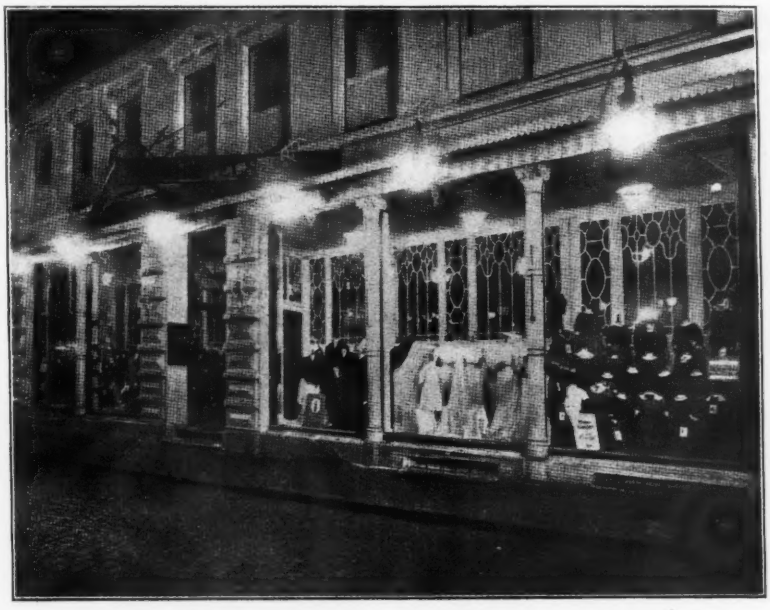
Just now there is being held in the Agricultural Hall, Islington, an exhibition with so comprehensive a title that it would be almost difficult to find anything which could not be more or less appropriately included in the show. Organized by the "Daily Sketch," and named "The Homes of All Nations," the display is a varied one, which for the greater part calls for no special notice here. There is, however, one exhibit that must be mentioned—both as being an excellent one of its kind, and as being of the first importance in connection with the homes of most nations.

Almost immediately on entering the main hall, the eye is caught by a stand on which the Gaslight and Coke Company draw attention to those useful and ornamental articles which, connected up to a gas service, do so much to add to the comfort of home life. Arranged to form the sides of a square, it has been possible to set out four distinct views on the stall—drawing-room, office, kitchen, and bath-room. Without overcrowding, there is a representative array of lighting, cooking, and heating appliances, drawn from the Company's Goswell Road show-rooms. Taking first the drawing-room, there is a handsome Davis barless fire, and an attractive floor lamp and shade; these, as well as various other appliances, being connected up to the gas supply. On the walls are some Kempton "candle" brackets with pretty shades. In the office section, there were noticed a "Nico" desk light, a three-light Messenger fitting, and a Hands one-light copper gas-pendant, with green silk shade. As to the bath-room, there are here several geysers fitted for furnishing hot water. All difficulty in connection with water supply and waste have been avoided by fixing above the stand a 50-gallon tank, from which the water passes through the geysers to the bath, and is afterwards pumped up into the tank again. There is also a Davis four-loop steamless radiator and a Richmond "Egyptian" fire. The last, but seemingly by no means the least attractive to the visitors, is the kitchen side, where there are Davis and Richmond gas-cookers, with a varied assortment of grillers, rings, toasters, and so forth, and a quantity of first-rate culinary utensils. A double "Surrey" condensing stove is included, as is also a Wilson circulator. In one corner of the kitchen there is a Richmond flashing device for drawing attention to the "Horseferry" vertical mantles, which are supplied at 3d. each. Careful consideration was naturally given to the illumination of the stand; and in the evening it is brilliantly lighted. In front of each of the four sides, rows of "Nico" bijou inverted lights are arranged in curves. They are provided with pretty beaded shades, and used without globes, so as to convince the sceptical that the heat does not affect the beads. The burners are suspended, too, by means of flexible metallic tubing. Pneumatic switches can be seen in operation; and there are some powerful overhead lamps for outside lighting—Podmore's, Smith's "Silva," and the "Nico Radio." Some Hands "Cool" burners are also to be noticed.

But the Company have also another exhibit, round which greater crowds assemble. This is situated in a corner of the Gilbey Hall; and it is a gas-kitchen in full work. It has been put up in a business-like manner; and the visitors are able to get close enough to see clearly all that is done by the ingenious *chef*, who spends his time showing those who desire to learn how simple it is to prepare elaborate looking dishes from the most simple materials. The kitchen, it may be remarked, is in a first-rate position; being close to the Theatre of Fashions, where, at intervals, the ladies congregate to witness new styles of skirts and other things which cannot be written of here. From the ornamental, one step takes them to the useful; and after seeing how they can be made to look, they are shown what they may be able to do—with the aid of gas. At different times, meals are prepared; and in the intervals, sweets, &c., are turned out in profusion. For instance, one day a dinner for two persons was cooked in an hour, with a consumption of gas which would cost 1½d. There were fillets of beef, sheeps' hearts, rhubarb pie, and Canadian apples. There is a Main double cooker; and a Richmond "Horseferry" cooker is also used sometimes, to demonstrate what can be done on a small gas-stove. A Wilson "Advance" cooker is on show, but not connected. Water-heating is represented by a Wright "Sun" boiler, a Davis gilled circulator, and a Ewart "Ever-Ready" boiler. The kitchen is effectively lighted outside by means of six Sugg "Regent" three-light lamps; while inside there are a number of smaller inverted burners.

Looking round the exhibition, there was noticed the "Hurry" gas-water heater, with which it is claimed that 10 gallons of hot water can be obtained in twenty minutes. There are no inner tubes, but a special burner "scientifically arranged so that about ten times more air than gas is introduced into the flame." The makers are the Hurry Water-Heater Company, of Broad Street, Birmingham.

An Exhibition Stand of the Gaslight and Coke Company at the Agricultural Hall.



Inside and Outside Lighting of an Oldenburg Store by "Pharos" Air-Pressure Gas-Lamps.

HIGH-PRESSURE AIR FOR SHOP AND PUBLIC LIGHTING.

At the meeting of the Southern District Association of Gas Managers on the 9th ult., Mr. Bernard F. Browne, in the course of his remarks when proposing a vote of thanks to Mr. Broadberry for his paper on "High-Pressure Shop Lighting," referred to the advantages of a high-pressure air supply for use in obtaining high-power lights from gas at ordinary pressures, as compared with a supply of high-pressure gas. He mentioned an instance on the Continent of a special street-main having been laid for affording a supply of compressed air to gas-lamps for public and shop-window lighting. The town to which he referred was Oldenburg, the chief city of the Grand Duchy of the same name. This town, with its suburbs, has a population of about 40,000; and the Manager of the gas-works, which are owned by the Corporation—Herr Oskar Wichmann—has courteously supplied us with the following information in regard to the supply of compressed air for gas lighting in the town.

A portion of the chief business thoroughfares in the heart of the town is lighted by electric flame-arc lamps of 8 ampères, five in a circuit. The current is taken from a privately-owned supply works. In order to demonstrate to the inhabitants that gas could afford the same lighting effects as the electric arc lamps, it was proposed to instal in a number of streets intensified gas lighting, with lamps of 1200-candle power. After thorough investigation, the compressed air system was chosen because the mains were to pass in places through streets planted with trees. Moreover, it was desired to make the intensified gas-lamps available for use for shop lighting; and it was inconvenient to instal special gas-meters for high-pressure gas, whereas no extra meters would be required for the compressed-air system.

The air for the supply is compressed in an electrically driven compressor capable of affording sufficient compressed air for an

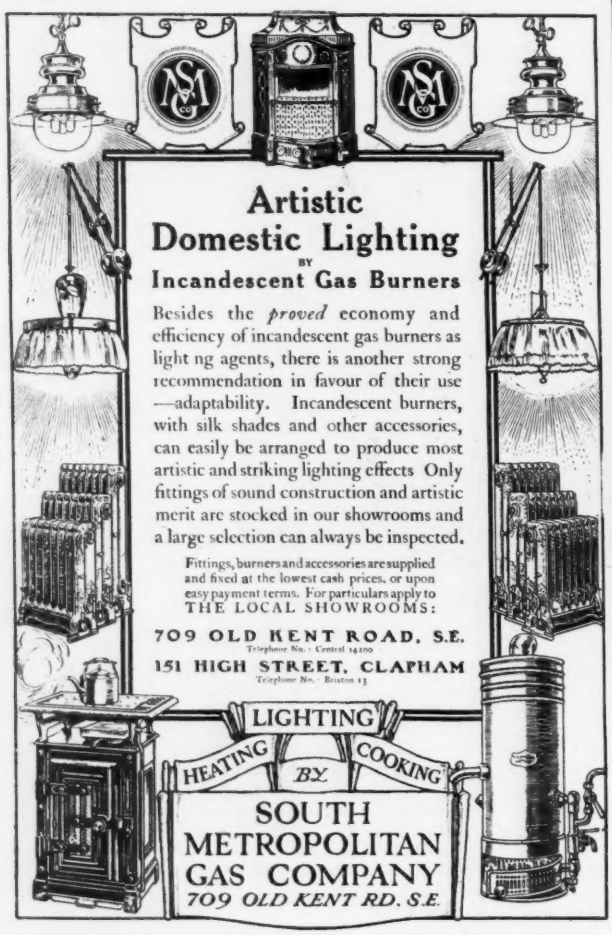
aggregate of 80,000-candle power. A 2-H.P. motor, coupled direct, is used to drive the compressor. In frosty weather, the air is passed through a receptacle filled with spirit. It is compressed to a pressure of 1400 mm. (55·2 inches). At present, the compressed-air mains have a length of 6560 feet; but it is intended to extend them and to instal a second compressor later. There are in all 39 lamps of 1200-candle power, at distances of about 138 feet apart. The lamps are on one side of the street only, as most of the streets concerned have houses on one side only—the other side being laid out as pleasure walks on the site of former fortification walls. Most of the lamps are upon fixed standards; the burner being at a height of 18 feet. But in a few places wall-brackets are used; and in two streets the lamps are slung over the centre of the street between the houses. These lamps are arranged for lowering. The lamps burn for the same time as the electric arc lamps—viz., from dusk until eleven o'clock in the evening. During this time, the compressed air is available free of cost for shop-window lighting, to shop-keepers in the streets where there are compressed-air mains. The gas consumed passes through the existing meter. Each shop-keeper has a tap on his compressed-air service, for turning on and off when the lamps are lighted and extinguished. There are at the present time fifteen shop window lamps thus connected to the air-mains.

In addition, the stores of the firm A. G. Gehrels and Son has its own compressed-air installation, which supplies ten outside lamps of 1200-candle power, and twenty-seven inside lamps of 500-candle power. The compressed air plant in this case has proved specially suitable, because it admitted of the existing gas service being further utilized, and in addition to the compressed-air lamps, there are still more than a hundred ordinary gas-lamps supplied from the same service.

Except for ten lamps which were made by the firm of Ehrich and Graetz, of Berlin, the whole of the lamps were obtained from the Pharos-Light branch of the German Incandescent Gaslight Company, of Berlin. The Ehrich and Graetz lamps have two burners; but the Pharos lamps give the light of 1200 candles with only one mantle. The lamps have governors and distance-lighters. They are all of the inverted type. The lamps ought, on laboratory tests, to consume about ½ litre of gas per candle per hour, which is equivalent to 56·6 candles [probably hefners] per cubic foot. The gas-works laboratory at Oldenburg not having apparatus for measuring lights of high power, cannot check this duty. The compressor was supplied by the German Incandescent Light Company. The lamps of both makes have behaved quite well, and so far no interruptions worth mentioning have occurred. The mantles have to be renewed on the average after a hundred hours' use. When there was a breakdown at the electricity works, and nearly the whole town was without current, the compressed-air gas lighting naturally failed also. At the stores of Gehrels and Son the lighting was, however, maintained quite properly by hand-driving of the compressor; so that while the surrounding shops (which had only electric lighting) were in darkness, the gas lighting at this stores was maintained in its full brilliancy, to the great satisfaction of the proprietor.

Herr Wichmann points out that compressed-air installations for street lighting have been in use in a number of German towns for a long time past. Among these towns, he names Wilhelmshaven, Witten-on-the-Ruhr, Stuttgart, Jena, Altenburg, Leipzig, Göttingen, Rostock, Meiningen, and Gelsenkirchen. All these installations, to the best of his belief, have been made by the German Incandescent Gaslight Company.

We may be able, in the course of a week or two, to give some illustrations of the shop and street lighting at Oldenburg by means of the compressed-air high-power gas-lamps.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RAISING AND LOWERING GEAR FOR PUBLIC GAS-LAMPS.

An arrangement of gear for the lowering and raising of gas-lamps in public thoroughfares, made by the "London Electric Firm," of George Street, Croydon, is shown in the accompanying reproduction of two photographs.

A Gas-Lamp Raising and Lowering Gear.

In this case, the winch and rope are inside the post, in contra-distinction to some the firm have made with the winch on the outside. The gear consists of their patent positive-acting safety-catch, which takes the weight of the lamp when in position. The rope is here only used for raising and lowering, and is, therefore, relieved from any risk of fracture due to the suspension of the lamp, or to its swaying in windy weather. The winch (also patented) secures the self-sustaining of the lamp without the aid of any small or delicate parts, such as ratchets, pawls, triggers, or springs. Consequently, the lamp is held safely—either when being raised or lowered—even if the handle breaks or slips out or becomes inoperative in any other way. The makers also arrange similar gearing for gas-lamps suspended on brackets, for lamps high up on shop fronts, for street spanning, church lighting, factory lighting, &c.

MANCHESTER JUNIOR GAS ASSOCIATION.

Twelfth Annual Meeting.

The Twelfth Annual Meeting of the Manchester and District Junior Gas Association was held on Saturday at Manchester. The programme for the day was a full one; and those who went through it were occupied for close upon twelve hours. There was a record attendance of members; some ninety being present.

A Round of Visits.

A start was made at eleven o'clock in the forenoon by a visit to the Albion Iron-Works of West's Gas Improvement Company, Limited, at Miles Platting, where they spent about two hours in an inspection of the various workshops. The work turned out from this establishment, which covers an area of more than four acres, is of a general engineering character; in addition to which the Company, as is well known, specialize in the manufacture of gas-producing plant, more particularly that connected with the carbonization of coal and the handling of coal and coke. The introduction and development of the Glover-West system of continuous carbonization in vertical retorts has added to the business. The world-wide reputation of the Company was evidenced by the work seen in progress during the inspection. At present they have in hand contracts for complete installations of the Glover-West retorts at the following among other places: Rochdale, Bradford, Helensburgh, Lurgan, Tokio (Japan), Sydney, Newcastle (New South Wales), and Fitchburg (Mass.). Other plant for gas-works was seen in course of construction; the places enumerated including Toronto, Genoa, Turin, Christiania, and Frederiksborg. At the conclusion of the inspection, the party were the guests of the Company at luncheon.

From the Albion Works the party went to the Bradford Road Gas-Works of the Manchester Corporation, for an inspection of the large gasholder now approaching completion. Mr. James G. Newbigging, M.Inst.C.E., the Chief Engineer to the Gas Department, gave the visitors some particulars of the holder. As already stated in the "Journal," it has a capacity of nearly 10½ million cubic feet; and its estimated cost, with the tank and inlet and outlet pipes, is £52,600. The majority of those forming the party went down into the tank, and subsequently mounted to the crown of the holder.

When the inspection of the gasholder had been completed, special tramcars conveyed the party to the Droylsden Gas-Works, to see the Glover-West installation of vertical retorts. As on the occasion of the recent visit to the works by members of the Manchester District Institution of Gas Engineers, Mr. Newbigging expressed regret at being unable to give detailed particulars of the plant and its working, in view of the fact that he has promised to contribute a paper on the installation to the Glasgow meeting of the Institution of Gas Engineers in June. Each visitor was, however, furnished with a booklet containing the particulars published in the "Journal" for Feb. 28 (p. 592).

Special tramcars then conveyed the party from Droylsden to Manchester for "High Tea" at the Exchange Hotel, after which the annual business meeting was held, followed by a social gathering.

THE EVENING MEETING.

At the evening meeting, Mr. Franklin Thorp, the retiring President, occupied the chair; and those present included Mr. J. G. Newbigging, M.Inst.C.E., Mr. H. Kendrick, of Stretford, Mr. S. Glover, of St. Helens, Mr. T. Duxbury, of Oldham, Councillor F. J. West, Mr. G. W. Tooley, Manager at the Rochdale Road Gas-Works of the Manchester Corporation, Mr. J. R. Hill, Manager at the Bradford Road Station, Mr. A. Massey, and Mr. E. West. Mr. W. Whatmough, the Hon. Secretary to the Manchester District Institution of Gas Engineers, telegraphed regretting his inability to be present; and Mr. Robert Watson, the President of the Institution, sent word that he was prevented by business from attending.

Annual Report and Balance-Sheet.

The President moved the adoption of the annual report of the Council; and it was adopted without discussion. This showed that 13 new members had been enrolled during the year, and that the membership was now 150, though the Council had found it necessary, much to their regret, to put Rule VI. into operation in 19 cases. The publication of the "Transactions" has been continued; and the Council are satisfied the volume will be of much value to the members. Referring to the two courses of lectures on the science of gas manufacture and combustion given at the University of Manchester, the Council stated that the attendance, averaging over 100, clearly showed that they were much appreciated. He added the following paragraph to the report: "The Association are much indebted to the Vice-Chancellor (Dr. Hopkinson) and Professor Harold B. Dixon, F.R.S., M.A., for arranging the lectures, to the Senate of the University for their generous contribution to the funds of the Education Scheme, to the Manchester District Institution of Gas Engineers for their moral and financial support, and to the Technical Press and the Council of the Gas Institution for their kindly recognition of the promoters' efforts." The Council also desired to draw the attention of members to the valuable library, which has been further enriched by the addition during the year of thirteen volumes of the Proceedings of the Institution of Civil Engineers, presented by Mr. Thomas Newbigging, M.Inst.C.E.

Mr. R. H. Garlick (Hon. Treasurer) presented the annual balance-sheet, which showed that the year was wound up with a small balance in hand.

The President pointed out that the University course of lectures had not cost the Association a single penny. He made this explanation because of a misapprehension which apparently existed on the matter.

The balance-sheet was approved.

Election of Officers.

There were two nominations for the office of Vice-President—Mr. D. V. Hollingworth, F.C.S., and Mr. C. E. Teasdale. On a ballot, the former was declared to have been elected.

A close vote as to the treasurership resulted in the election of Mr. J. Robinson; and Mr. J. Alsop was unanimously re-appointed as Hon. Secretary—many complimentary remarks being made about the manner in which he discharges the duties of the office. Eleven names were put forward for the five vacancies on the Council; the result of the ballot being given below:

Hon. Secretary.—Mr. J. Alsop.
Hon. Treasurer.—Mr. J. Robinson.
Auditor.—Mr. J. Wareham.
Members of the Council.—Messrs. J. M'Nicholl, C. E. Woodhead, C. E. Teasdale, W. H. Cummings, and W. L. Heald.

The Work of the Council.

Mr. W. Hill proposed a vote of thanks to the members of the Council for their services during the past year. He thought all would agree that the work done by them had reached an ideal standard. He recommended those members who had not taken advantage of the lectures which had been given at the Manchester University not to miss the next course, if arranged for. The lectures they had had during the winter were of such a character as to be of great assistance to members of the Association in the class of work they were expected to carry out. He did not agree with the suggestion that had been made to the effect that the lectures had been somewhat above the heads of the members, and desired to add that whatever they required in the class of lectures, either at the University or at the Technical School, could be had for the asking. They had only to let their wishes be known, and the class of lecture wanted would be provided for them. He remembered some twenty years ago having an interview with Mr. Reynolds, at the Technical School, and asking if it was not possible to have classes in gas manufacture. Mr. Reynolds replied that they had not previously been asked to arrange such classes; but he said that if a sufficient number of members desired such a class, there was no doubt about one being formed. As to the class of lectures at Owens College, they might not have been all some desired; but this was because the authorities did not know exactly what was wanted. He repeated that members had only to make their wants known, and the class of lecture required would be provided.

Mr. J. Bridge, in seconding the motion, said the work of the Council during the past year would long be remembered by members of the Junior Gas Association, and highly appreciated. The lectures at the University, coupled with the visits to different works during the year, had unquestionably increased their knowledge, theoretically and technically, and made them better able to carry out their work in the industry in which they were engaged.

The motion was carried.

Mr. S. Carter, in responding for the Council, said the work of the past year had certainly been more onerous than usual, and at times rendered difficult, for the reason that they were without precedent. Although they had not been able to give complete satisfaction all round, he believed the programme gone through had commended itself to the bulk of the members; and guided by the experience of the past, the Council, with the assistance of the members, would no doubt get a little nearer the ideal during the next term.

It was resolved, on the motion of Mr. A. L. Holton, President-elect, that the Hon. Secretary write a letter to each of the following: Mr. R. H. Garlick, Mr. J. Taylor, and Mr. J. E. Dudley, expressing the members' appreciation of the work they had done for the Association. They had given years of service to the Association, and it was desired to have a record on the minutes of the same.

A Memorable Year.

The President said that, before calling upon his successor to take the chair, he would like to say something about the work which had been done during the past year. When he took over the command from his predecessor, Mr. J. Taylor, he found the vessel in grand trim, and the officers, every one of them, up to the mark; and he was confident that when he handed over the control, they would have a popular, capable, and energetic successor in Mr. Holton. The past year had been a memorable one in many ways, especially from an educational point of view; and he claimed, despite some possible disadvantages, that they had had a successful year. He was happy to say that the success achieved was not due to any one man; the members generally had materially assisted, in attending the lectures at the University and the various visits to works in such large numbers. This day, however, capped all, for they had had a record attendance.

It would be remembered that the Council at the last annual meeting were authorized to carry out a certain programme, and he hoped members would agree that the orders had been carried out well. So far as he himself was concerned, his task had been an easy one, because of the very able set of officers associated with him. Much of the success they had achieved on the educational side was due to the assistance given them by the Senior Association; and he desired in this connection to mention the names of Messrs. Kendrick, Duxbury, Meunier, and Whatmough, whose help they very much appreciated. He thought the Junior Association stood in a better position to-day than it had ever done before; and all must regard with satisfaction the recognition they had had in their University scheme from the Gas Institution. He trusted that the work they had undertaken in this direction would be carried to even greater heights under the presidency of Mr. Holton.

Mr. A. L. Holton, on taking the chair, met with a flattering reception. Having acknowledged the compliment paid him, he moved a vote of thanks to Mr. Thorp for his services as President during the past year. He spoke highly of the way his predecessor in the chair had done his work.

Mr. J. Taylor, in seconding, remarked that the past year would be looked upon as the most successful the Association had ever had; and he said this without casting any reflection upon previous occupants of the chair.

The resolution having been carried with applause, Mr. Thorp briefly responded.

PRESIDENTIAL ADDRESS.

Mr. Holton then proceeded to give his Presidential Address, as follows.

When coming to Manchester some nine years ago, it was my good fortune to become acquainted with our Association, and to recognize its worth to a young man anxious to improve himself in the gas profession. My interest and enthusiasm must have been noted by the Council; for, within a short time, I was invited to occupy a vacant seat upon the Council, and ultimately to undertake the duties of Hon. Secretary. Your appreciation of my labours in that capacity far exceeds their true worth, and culminates in the honour and compliment you pay me to-day by electing me your President for the ensuing year.

From a knowledge thus obtained, together with that through the office of Hon. Secretary to the Joint Council of the Junior Gas Associations of England, a word upon the general outlook of our proceedings as a whole may not be out of place. Well may the gas engineer of the past generation envy the facilities we now enjoy of becoming proficient in the numerous duties pertaining to the management of a gas undertaking; and we shall do well to remember that these very facilities imply that, unless we make use of them to the utmost, it were well for us had we chosen another vocation.

There can be no question about the utility of the Junior Associations in the education of a young man entering the profession; and it is the educational part of our work that must ever be kept to the forefront.

THE WORK OF THE JUNIOR ASSOCIATIONS.

This year, for the first time, we are to have a limited number of the "Proceedings" of the four English Junior Associations bound up in one volume; and I venture to say that it will contain a mass of valuable information. I use the word "mass" advisedly; for in this particular we might hope for much improvement—an improvement brought about by specializing our year's work. If this view was taken by all the Junior Associations, the result would undoubtedly be an annual volume of proceedings that would be a veritable text-book. The very nature of our Associations, and the numerous meetings we hold, give us time and opportunity to deal with various details and points in gas-works procedure that would, on the surface, appear trivial for the Senior Gas Associations, and yet are of vital importance if we are to be abreast of the times.

It is a pleasure to note that for a number of years now, each year has seen the inauguration of some definite advance in our work. In 1903, we had the first joint visit with our colleagues from Yorkshire, which has since become an annual function. This was followed in successive years by the provision of a library, the inauguration of an annual lecture, and a united gathering of the four English Associations, which, by the way, gave the junior gas movement an impetus little thought of by its instigators, and resulted in the formation of a joint representative Council. Then followed the link with the Manchester Institution of Gas Engineers; and last, but by no means least, the year just closed has been notable for the series of six University Lectures. The Council you have just elected to carry on your affairs will feel that they have an important duty devolving upon them to keep up this rate of progress, and with such a past record will be stimulated in all their endeavours.

Two Junior Gas Associations have held meetings in the Universities of their respective districts and the others in Technical Institutions.

The signs of the times are distinctly encouraging; and, in passing, I would remind you that the growing closer relationship of the Senior and Junior Gas Associations, coupled with the desire of the University authorities to take their rightful place in the elucidation of technical problems, has made the position what it is to-day. We cannot be too grateful, as juniors, for all the help that has thus been afforded. But it must not be taken for granted that the past year's course of lecture and special classes is to be a model for all future arrangements, but rather as a means of focussing our requirements, and giving guidance in arriving at a workable scheme.

THE HELP OF THE UNIVERSITIES.

There are two distinct classes requiring our consideration—the young men about to enter the gas industry, and those already engaged therein. The highest scientific and technical training must be made attainable by all of the former class; and surely this is now met by the special course of study at the Leeds University. But what about the men who are engaged in gas-works, and have neither the time nor the opportunity to take up such a definite course? It would not be right to allow these to get behind in the race, for want of opportunity to improve their knowledge to the best their time will allow; and it is this class of men who, forming the large majority of our Junior Gas Associations, claim our first and foremost attention.

About two years ago, various branches of the Society of Chemical Industry had brought before their notice the "University Training of Technical Chemists." Professor F. G. Donnan, at the Liverpool Section, in the course of his paper, asked the following question: "Is there any essential distinction between the so-called 'pure' science cultivated at our Universities and the so-called 'technical' science investigated and utilized in industry?" And he answered it as follows:—

> The orderly, arranged facts, and the resulting laws and principles of chemistry, constitute the science of chemistry. This science is obviously the same, whether chemical reactions take place in a University laboratory or in a works plant. But in a works the science of chemistry is combined with two other great sciences—namely, the science of economical production and that of engineering. It is clear that the technical chemist, while knowing all about the facts and principles of chemistry, has two new variables to deal with—namely, price or commercial possibility, and bulk or engineering possibility. As our American friends well express it, he has to reckon with the "dollar" co-ordinate, and also, as I have just said, with the engineering or "bulk" co-ordinate. If we say that the University laboratory usually deals with only one co-ordinate or variable—*i.e.*, that of scientific truth or accuracy—then the works laboratory deals with a higher space determined by the three co-ordinates of scientific accuracy, price, and bulk. The success of a research in a University laboratory is determined by the truth of the fact or principle established; while the success of a technical operation or research requires, in addition, the correct determination of the two other factors already mentioned.

In this statement, I venture to say, lies the true relationship of the University to the problems confronting us in our everyday work, and it should assist in answering the question often asked, "What help do we derive from these special lectures and highly-trained University men, to elucidate the problems that confront us as gas engineers?"

THE CHEMICAL SIDE OF GAS MANUFACTURE.

The special branch of an industry a man takes up, must naturally affect his view; and I shall therefore be pardoned if I express the opinion that a gas-works should be looked upon as a chemical process with its engineering and chemical divisions. The process of manufacture and purification is distinctly within the purview of the chemist. The engineering side of gas manufacture has ever steadily advanced, and is still making headway, due largely to the skilful minds that are at work, and the large amount of money expended, in perfecting plant to cheapen the cost of production, by labour-saving devices and greater output per unit.

Unfortunately, the chemical side of gas manufacture has, in the past, received but scant notice. The number of gas-works at which definite chemical research is carried out in this country could, I venture to say, be counted on the fingers of one hand; while many of the so-called "chemists" engaged on gas-works are just able to go through the routine work required, and no more. So do not express surprise at the slow rate of scientific advancement in our work.

Unlike many chemical manufactories, a gas-works cannot be "stopped for alterations" or adjustment of conditions; and any system of manufacture, bye-product recovery, or purification must possess a greater certainty of action than is called for in a process that can be cased-down or temporarily stopped when the reaction gets out of hand.

AMMONIA LOSSES.

Fortunately, there are yet many economies that can be effected, and that bid fair to yield a profitable return for the expense bestowed upon them. The keen, and often unfair, competition to which gas undertakings are now being subjected, calls for a closer watch on all sides. We shall have to "gather up the fragments," and thus effect a total economy that shall ever keep us to the front as to lighting, heating, and power. Vertical retorts are yet in their infancy; but all the systems claim, along with other advantages, a greater yield of that valuable bye-product, ammonia. There is every reason to anticipate that such a system of carbonization will be more amenable to adjustment of economical scientific conditions of working than the older processes.

According to Mr. Marshall, the amount of nitrogen lost, and that might be converted into ammonia, is not a mere fragment, but a whole basketful. But no matter if we are inclined to view with scepticism the high figures he gives, we shall all be agreed that the vast majority of our works are losing ammonia already in the gas,

as such, to say nothing of the nitrogen that may by some process be converted into ammonia. The amount of ammonia allowed to pass forward into the oxide purifiers is greater than many managers are aware of; and not only does it represent a loss to the gas undertaking, but it is the cause of considerable worry and expense to the manufacturer of sulphuric acid in the regulation of his chamber process.

Let us assume the case of a works selling 1000 tons of oxide per annum; that the oxide contains 0·5 per cent. of ammonia (a figure often greatly exceeded); and there is a loss equivalent to nearly 20 tons of ammonia sulphate.

Many works, owing to size and locality, have received but a poor return for the ammonia recovered in the gas liquor; and in such cases the plant devised by the Chemical Engineering Company for its direct absorption (and so favourably spoken of by Mr. P. G. Moon, of Bournemouth, in his paper before the Southern District Association of Gas Engineers in November last)* will prove a valuable one.

PURIFICATION QUESTIONS.

Tarry matters no longer present difficulties in the direct production of sulphate of ammonia, as these can be eliminated by a system of washing as described in the paper referred to or by centrifugal action. Even the ordinary process of washing and scrubbing the gas might be more intelligently carried out. The relative amounts of sulphuretted hydrogen and carbonic acid abstracted from the gas in this part of the plant can be controlled considerably; and in many cases a knowledge of the work done would lead to more economical practice.

Mr. Sheard, in his lecture at the Victoria University, Manchester, very aptly described the process of "self-purification" as a fascinating problem for inventors. Many schemes have been suggested, and ideas patented; but it is doubtful if that certainty of action and simplicity of working has been arrived at which, as previously mentioned, is an essential in gas-works practice.

The Burkheiser purification process is at present claiming considerable attention, and introduces many novel features; the latest improvement being the conversion of the SO_2 produced into SO_3 by means of a contact-chamber. Since the gas in the process is passed direct from the condensers and tar-extractors to the oxide purifiers along with its ammonia content, many interesting conditions are set up, and a comparison of the yields of sulphate of ammonia is to be desired.

Although "self-purification" appears to be the ideal one, in all probability the production of sulphate of ammonia by the direct absorption of sulphuric acid will come largely into use. Sulphuric acid is, with but few exceptions, only manufactured by the very large gas authorities. If, however, the following points be taken into consideration, it will be found that a works producing 700 million cubic feet of gas per annum should in most cases be able to manufacture sulphuric acid cheaper than it can be purchased for: 1. The spent oxide is ready to hand. 2. The sulphuretted hydrogen expelled in the distillation of ammoniacal liquor can be readily burned in a simple kiln, and the SO_2 produced, and passed along with that from the burning of the spent oxide to the nitre ovens and chamber process. 3. The sulphur derived from the sulphuretted hydrogen amounts to about 15 per cent. of the total sulphur required. 4. The methods of dealing with the waste saturator gases, other than the above, present many difficulties.

SPENT OXIDE.

Much attention is now being paid to the utilization of burnt oxide for gas purification. Mr. J. T. Sheard, in the lecture already referred to, gave results of some interesting experiments on its value in this respect; and taking these in conjunction with the data given by Mr. Joseph Tysoe in his paper before the Southern District Gas Association on Nov. 14, 1907,† there seems every possibility of being able, in the near future, to utilize this waste product over again with confidence in its chemical activity.

Mr. W. Wyld has recently brought out a patent mechanical furnace for the burning of spent oxide on a travelling band through a locally heated furnace; the object being to burn off the sulphur without unduly subjecting the ferric hydrate to excessive heat. He claims to thus produce a spent oxide that will give excellent purification results. Should this prove all that he claims, it will further enhance the economy of manufacturing sulphuric acid at gas-works, for the burnt residue will again be on the site ready for re-use in the purifiers.

SULPHATE OF AMMONIA PLANT.

At the January meeting of 1910, I had the pleasure of reading before you a paper entitled "Notes on the Manufacture of Sulphate of Ammonia,"‡ in which I endeavoured to outline the essential features of a serviceable sulphate of ammonia plant. Two other makes of stills have recently come under my observation; and, from a knowledge of their working, I can further emphasize the points then enumerated. Since the paper dealt almost exclusively with the principles of construction, a consideration of a few special circumstances that arise in the working of a sulphate plant will be a fitting supplement to it; and my subsequent remarks must be taken in conjunction with the views I then expressed.

In the smaller-sized plants, worked only during the day-time, difficulty is often experienced by the first batch of sulphate being of a very dark colour, while in many cases the amount of mother liquor accumulated during the night causes additional trouble. These two points have been coupled together, as the remedy for both is in the stopping and starting of the plant. The manager should, by experiment, determine the length of time it takes to boil-off the ammonia after the liquor supply is shut off; and then, allowing a fairly liberal margin for deviation in strengths of liquor, he should give orders for the operator to turn off the liquor supply at the predetermined time, and the steam to be shut off when he finishes for the day. Directly the steam supply is shut off, a tap or plug-hole should be opened on the saturator ammonia inlet pipe; and presuming this is fitted with a baffle-box as described in my paper, both difficulties will disappear. The dark sulphate is due to the ammonia given off after the attendant has left the works, and the accumulation of mother liquor to condensation of steam during the night. A further advantage of the baffle-box, with its vent cock or plug, is that an earlier start can be made each morning. Orders can be given to a responsible man on the night shift to turn on to the still a small quantity of steam about two hours prior to the sulphate maker starting work; and thus he is able to commence the distillation with the least possible delay.

The saturator occasionally gets partially blocked with very hard and dirty salt, and sometimes in such quantities as to seriously affect the working. Should the salt build in front of the cracker-pipe, local alkalinity may occur; and I have known of a case where it nearly stopped the outlet gas pipe, causing serious back-pressure. When these conditions exist, the manager naturally blames the acid, and decides on using a better quality at, of course, a higher price. Before taking such a step, however, I would suggest that he examine the working of the saturator to see if a good boil is maintained, and to give the outlet and inlet gas-pipes a thorough wash with water about twice a day. On large plants, the liquor should be shut off, and the saturator boiled up for an hour every third day, with a daily wash of the gas-pipes.

The salt in question is mixed with an accumulation of the scum arising from the acid; hence a periodical douche of water causes the scum to sink and mix with the sulphate. When this is regularly performed, the colour of the salt is not materially affected.

Sulphate made from acid containing an appreciable amount of lead sulphate is very slow in drying, and may even never really be fit for sale.

Special causes may arise when, at the usually accepted salting strength of 58° Twaddel, the whole bath is alkaline. Therefore, a safer rule to adopt is to fix the working strength at 2° Twaddel above its alkaline point. The sulphate sold should be kept below 0·4 per cent. of free acid; and it may be of interest to note that a 2 cwt. bag filled with sulphate containing this percentage of free acid and 3 per cent. of moisture was in excellent condition after being packed for two years.

A source of loss to the sulphate plant, and one not usually examined, is the bagging and weighing of the sulphate. When possible, it is advisable to check the men's separate bag weighings by also having either the truck or lorry weight taken.

Dr. Fowler has been experimenting for a number of years on the direct biological purification of ammonia-recovery liquors on percolating filters; and those interested in the question should refer to the three papers dealing with this subject, published in the "Journal of the Society of Chemical Industry" for Feb. 28 last.* The first paper, on the "Bacterial Purification of Ammonia Recovery Liquor," by Gilbert J. Fowler, D.Sc., Edward Ardern, M.Sc., and William T. Lockett, M.Sc., deals with the chemistry of the question. The second paper is by Dr. Fowler and myself, and gives results and details of the works experiment on the waste liquor produced at the gas-works of the Manchester Corporation over a period of six years. The third paper, by Dr. Fowler and Stephen W. Shepherd, gives the results of an experiment on a larger scale, on the waste liquor produced at the chemical works of the Bradford Corporation.

The oxygen absorbed figure of waste liquors varies considerably; thus the effluent from the two works in question averages 500 and 700 respectively on the four hours oxygen test. Taking the effluent of the Manchester works, it was found that a filter-bed of 400 cubic yards would give a total purification of approximately 98 per cent. per ton of sulphate per diem. In small-size plants, situated where land is cheap, the process can be strongly recommended, and in all cases should receive serious consideration.

CONCLUSION.

There are many possible chemical processes connected with our work that have not been touched upon—some because from a remunerative standpoint they are at present debarred from serious consideration, and others on account of requiring much further investigation.

In closing, I want to urge the importance of taking regular daily tests, and the keeping of a systematic set of books, so that from time to time a balance-sheet can be drawn up of the various products we are dealing with, and our loss clearly shown. It will then be our paramount duty to investigate the cause of the loss, and thus we shall be able to effect economies that will help the industry to hold its own against all competitors.

VOTES OF THANKS.

Mr. R. H. GARLICK moved a vote of thanks to the President for his address.

Mr. W. BUCKLEY seconded, and said they had heard something

* See "JOURNAL," Vol. CXII, p. 474. † *Ibid.*, Vol. C., p. 565.
‡ *Ibid.*, Vol. CIX, p. 171.

* Abstracts of these papers are in type, to appear in an early issue of the "JOURNAL."

of what could be done by the association of the chemist and the engineer in a gas-works. There was no reason, in his opinion, why gas-works should not be made as profitable as many of the chemical professions; and they knew that some of the biggest dividends were paid by works which were "chemist managed."

The resolution was carried; and the President briefly acknowledged the vote.

Mr. THORP next moved that the thanks of the members be tendered to the Gas Committee of the Manchester Corporation, Mr. J. G. Newbigging, Mr. Hill, Mr. Massey, and West's Gas Improvement Company, for the facilities afforded for an inspection of the different works that day. He observed that the Association had been specially favoured in being shown the Glover-West system of vertical retorts at work, and also in hearing the marvellous results obtained from the installation. The highest achievement of an inventor was to get great results with simplicity; and he (Mr. Thorp) thought this had been obtained by the installation they had seen that day.

Mr. J. M'NICHOLL, in seconding, remarked that Messrs. Glover and West were to be congratulated on the success of their system of vertical retorts, and the Manchester Gas Committee and their Engineer on their enterprise in putting down such an installation, the success of which, he thought, was beyond doubt.

The motion having been carried,

Mr. NEWBIGGING responded. At the outset, he said he had been asked to convey to the meeting Alderman Gibson's regret at being unable to be with them that evening. Alderman Gibson was as much a "junior" as any of them; but they would quite understand that he had to limit the number of his engagements in the evenings. There they had seen a system of carbonization which he felt confident would in a very few years become universal, though there were a good many systems of carbonization in existence. He would like to take this opportunity of congratulating the newly-elected President, who was a capable and popular member of the technical staff at the Manchester Gas-Works, on the excellent address he had given. Mr. Holton's remarks on the branch in gas manufacture of which he was such a capable exponent, would no doubt be much appreciated by the members of the Junior Gas Association.

Mr. F. J. WEST also responded. It had been a pleasure, he said, to him and his colleagues at the Albion Iron-Works to show the members of the Association round the various departments, and to note the keenness displayed during the inspection by those composing the party. He complimented the members on the endeavours they were making to better fit themselves for the duties they were called upon to perform in the industry which it was their privilege to serve.

KINDRED ASSOCIATIONS.

A short toast list was next gone through. The first was that of "Our Guests," submitted by Mr. F. DEAN, and responded to by Mr. J. R. HILL.

Mr. C. E. WOODHEAD, in proposing "Kindred Associations," ventured to say that the past year would stand out in the history of the Manchester Junior Association because of the closer relationship established with other and kindred organizations. To begin with, they had received from the parent body—the Gas Institution—the greatest sympathy and encouragement in regard to the University scheme; and he thought this might be regarded as a happy augury for the future, if occasion should arise for them to lay before that organization any matter on which help and advice were required. The Manchester District Institution of Gas Engineers he must make special mention of. During the past twelve months, the Junior Association had made great progress; and one important factor in this success had been the help and assistance given them by the Senior Association. Their President had been allowed a seat on the Council of the Senior Association; and on their part, the latter had sent a representative to the Council of the Junior Association—an arrangement which had been of inestimable value to the latter. The relationship existing between the Manchester Junior Association and the other Junior Associations was of the most cordial character; and they were all looking forward to the joint meeting at Birmingham in May to strengthen it.

Mr. H. KENDRICK, ex-President of the Manchester District Institution of Gas Engineers, in responding, said he thought the way in which the Council of his Association had met the juniors in connection with the University scheme showed that the seniors hoped the work undertaken would go on and prosper, so that the juniors might become fitted for the position which in the future they hoped to fill. In congratulating Mr. Holton upon his valuable address, he remarked that the newly-elected President spoke apparently as though gas-works management consisted of but two departments, dealing chiefly with the engineer's side and that of the chemist. Now he (Mr. Kendrick) was one of those who believed there were three important departments in a gas-works. In addition to the two mentioned by Mr. Holton, there was the selling department; and he was quite convinced that the status of the distribution officials would have to be raised, if they were going to obtain the results they ought to have from the gas manufactured. The Council of the Manchester Institution of Gas Engineers were doing something in this direction; and hoped before long to come to an arrangement whereby the status of men engaged in the distribution department connected with gas-works would be raised. They were also hoping to be able to make the gas-fitter more efficient and capable, with advantage to all concerned. He assured the members of the support and continued help of the Senior Association in the work that they had in hand.

The concluding toast was that of "The President;" the gathering ending with the singing of "Auld Lang Syne." During the evening songs were rendered; and there was an exhibition of conjuring tricks and ventriloquism.

VICTORIAN GAS ASSOCIATION PAPERS.

In the last number of the "JOURNAL," we gave a report of the general business at the annual meeting of the Victorian Gas Association in Melbourne last November. As already mentioned, the two papers read and discussed on the occasion did not accompany the report, as advised by the Secretary; but it was hoped that they would be received by the next mail. Unfortunately, they have not yet come to hand. We, however, give to-day the notes of the discussions on the subjects in the "Question-Box," leaving the remainder of the report for a subsequent issue.

THE "QUESTION BOX."

I.

"Which meter is the more suitable for the Australian service, the wet or the dry? How often should meters be brought in and tested?"

Mr. F. TIPPER (West Melbourne) said he had come to the conclusion that in Australia the dry meter was to be preferred, for many reasons; the chief one being the position in which a meter was generally placed there as compared with that occupied in houses in Great Britain. In England the meter was generally fixed in a cellar, or in some out-of-the-way place where it was not annoying to the eye; but in Australia it was very often located in a prominent position. All through the Melbourne suburbs, the meter-box on the verandah was one of the first things to catch the eye. He contended that a wet meter would not be so suitable for this position as a dry one, because the watering was difficult to accomplish without causing some little annoyance from the smell arising. Moreover, a wet meter in a warm climate was subject to rapid evaporation of the water during the greater part of the year. With regard to the merits of the two meters, there was very little to choose between them, and of all the means and methods of measurement in use as between buyer and seller, he knew of no fairer servant than the gas-meter, whether wet or dry. With regard to the question of how often meters should be brought in and tested, he put the period at seven years.

Mr. R. BEARUP (Stawell) approved of dry meters for Australia. He remarked that if a wet meter were used in a house where the gas-fittings had not been properly put in—that was to say, laid over the joists in the ceiling—it would cause the gas to jump, owing to condensation in the dips of the pipe. With a dry meter, no water rose into the pipes.

Mr. H. W. BEAN (Warragul) said that when he was in Brisbane the Gas Company took out all the dry meters and put in wet ones; the reason being that the earth was cooler than the atmosphere. The gas used to enter the meters and condense, causing the wires on the bellows to rust; the consequence being that as the bellows worked backwards and forwards the rust scaled and cut holes through the leather. The meter would then pass more gas than was recorded. Of course, wet meters required more attention than dry ones.

Mr. HUMPHREY (Hamilton) said he had some trouble at Charters Towers with dry meters through the slide-valves sticking; and he had to adopt wet ones. They had the same trouble at Maryborough. Since he had been in Victoria, however, he had had no difficulty with the dry meters; and personally he much preferred them.

Mr. E. TIPPER (Box Hill) said he used dry meters only. When he first took over the works, there were some 40 or 50 wet meters in use; but he changed them, not because he thought the dry meters better, but because he wanted to have one type only in use. He thought, with Mr. Bean, that in any place where there was liability to condensation the wet meter was the better one. As to changing meters, he did not consider there could be any fixed rule as to period. In a small concern, the oftener meters were changed the better.

Mr. J. W. THOMPSON (Melbourne) remarked that the Melbourne Gas Company had lately been testing meters which had been in use for some years, and out of the entire number about half were found to be going fast and half slow. Their experience showed that it would be better to change meters every six years.

Mr. BOWMAN (Sale) asked if increased pressures would have any effect on wet meters. In Sale, the usual pressure was about 2 inches.

The ACTING-PRESIDENT (Mr. S. E. Figgis, of Ballarat) said he did not think wet meters would be affected by variations in pressure, unless there was a sudden jump from 3 to 6 inches. Occasionally there had been slight accidents in Ballarat; and it was almost invariably found that the suddenly increased pressure had affected the wet meters, but not the dry ones.

II.

"At times I have complaints of bad supply caused by naphthalene being deposited in consumers' services. How can I reduce this evil or prevent it altogether?"

The SECRETARY (Mr. C. W. Howlett, of South Melbourne) said the member who asked the above question had the deepest sympathy of his brother gas managers all the world over; and to the one who could successfully reply to it would be meted out thanksgiving from a united body of men who had been struggling with

the same difficulty for many years past. When complaints of bad supply became numerous, the first investigation should be to ascertain if the stoppages were caused by naphthalene or by an accumulation of rust, &c., in the services. The general practice seemed to be to blame naphthalene every time an obstruction was found. One indication of naphthalene stoppages was that complaints would be more numerous in the summer than in the winter, owing to the higher temperature of the gas when leaving the works, as it thus carried more naphthalene with it. Naphthalene, as they all knew, was one of the greatest troubles in the gas industry; but in many cases, especially where there were small and old service-pipes, the stoppages were caused by accumulations of rust and dust from oxidation, which, aided by a little moisture, set into a hard cake. This obstruction, by presenting an uneven surface to the passage of the gas, caused a deposit of naphthalene. The condensation of water in a service-pipe would cause naphthalene to deposit, because the accumulation of condensed water lowered the temperature of the gas. Therefore one of the greatest factors in successfully combating the naphthalene trouble was to keep the gas as cool and as dry as possible at the outlet of the works; and this could only be done by having an efficient system of condensation. Of the many methods, both mechanical and chemical, used to remove naphthalene from service-pipes, it was rather a difficult matter to form an opinion as to the most effective one, as the local conditions in each works were so varied. Some service-clearers adopted the practice of pouring hot water down the service-pipe. This only removed the naphthalene from the pipe to the main, where it was deposited again as soon as the water cooled, and picked up when some warm gas came along on a hot day. Another method was to pour benzene, naphtha, or kerosene down the pipes. These solvents took up the naphthalene, and held it in solution for a considerable time; but being of a volatile nature, they evaporated, and were taken up by warm gas, probably carrying some of the naphthalene with them, but leaving most of it in the mains or services. If the solvents could be removed after dissolving the naphthalene, the trouble would be overcome. If, in clearing services, instead of using hot water, benzine, naphtha, or kerosene, some of the light tar oils, prepared as specified, were poured down the pipes, these, being more stable than the other solvents mentioned, would tend to keep the naphthalene in solution until it could be pumped from the syphons. If at the same time the gas were washed on the works with the oils, he thought the trouble would be considerably reduced, perhaps removed altogether.

Mr. D. Warren (Footscray) said his difficulty with naphthalene had been so infinitesimal that when it occurred he had found that a little kerosene poured down the tap to clear the service had been effective. As a permanent measure, however, he should like to provide against naphthalene by the use of Maitland coal, because it had the peculiarity of taking up the condensed products and liquefying them. He had seen a dry meter, which was crammed full of naphthalene, completely cleared within a month by passing gas from Maitland coal through it.

Mr. T. Lord (Geelong) said he had had a great deal of trouble with naphthalene. He remembered an experience he had some years ago at one of the banks in Geelong. They had a 10-light meter, which had to be taken out about every week and washed thoroughly. As an experiment, he fixed to the service at the inlet of the meter, a little box, capable of holding about two quarts, and filled it with naphtha to within ½ inch of the inlet-pipe; thus letting the gas blow on to the naphtha. From that time forward this particular service had not been obstructed with naphthalene. Afterwards he ran short of mineral naphtha, and used kerosene, which appeared to act as well.

Mr. Taylor (Benalla) said he was once appointed Manager of a works in England where, as a result of naphthalene trouble, five managers had preceded him in seven weeks. When he saw the state of affairs, he was very disheartened. The holder was down, and a 4-inch foul main and a 6-inch vertical tar-tube were sealed through to the holder. He did not mean literally sealed, but one had to charge a retort, and then wait until the gas got through, before charging another. He cut out the choked pipes and put in new ones. When taking out the old pipes, he found they had been drilled at every yard, evidently to clear the naphthalene. He then fixed between the condenser and scrubber a 50-gallon tank with a steam-coil in it, and filled it with ammoniacal liquor, which was heated by the coil to a temperature of about 130° Fahr. With this liquor he sprayed the gas; and he never had a recurrence of the trouble while he was at the works. The strength of the liquor he used was 5° Twaddel; and after spraying the gas with it, he let it run to waste. He did not test the liquor, after washing the gas, to see if it contained any naphthalene. The spraying did not make any difference to the illuminating power of the gas.

Mr. Humphrey (Hamilton) said he had had some trouble with naphthalene, mostly during the winter months, in North Queensland. He once had the inlet to the holder stopped; and after ineffectually trying several methods to clear it, he succeeded by putting a pipe down to the bottom, and boiling out the obstruction with a steam pressure of 120 lbs. His experience had taught him that naphthalene deposited in shallow pipes during the winter, or in pipes laid under lawns which were frequently watered.

Mr. W. Pain (Bendigo) said many years ago he had trouble with naphthalene, mainly owing to insufficient condensing, but also to intense heats and using damp coal. Since increasing their condensing power and carbonizing Maitland coal, they had been free from naphthalene. They had up to the present carbonized upwards of 20,000 tons of Maitland coal, and were working with a steam-jet exhauster.

The Acting-President said there seemed to be a consensus of opinion that Maitland coal was a very good remedy for naphthalene; but a great deal seemed to depend on condensing. This emphasized the fact that they should always have the condensers as large as possible, so that the flow of gas would be very slow. In Ballarat they were not much troubled with naphthalene; but when a sudden change of temperature occurred, they had occasional stoppages. He had found the Maitland coal was a distinct advantage in respect of naphthalene. The fact was that any coal that would yield a rich gas was a solvent; and with the use of a little mineral naphtha in the service-pipes, the trouble would be reduced to a minimum.

III.

"In some parts of our district the service-pipes have a very short life How can I best protect them cheaply and effectively?"

Mr. W. Pain (Bendigo) said that there was very bad ground in certain places around Bendigo, and he had seen service-pipes worn out in from seven to ten years; whereas in other localities pipes were taken out in good condition after being in the ground 30 to 35 years. As a protection against bad ground, he tarred service-pipes some weeks before laying them—sometimes giving them two coats. Then when he put them in he gave them another coat, and banked them up in sand. He found this method very useful. Sand was cheaper than wood, and it did not take long to run over a few thousand feet of pipe with tar. The application of the sand after tarring had the effect of encasing the pipe in a kind of asphalte.

Mr. Foster (Oakleigh) said that when he was at Deniliquin a few years ago he had a good deal of bad ground, which rendered service-pipes laid in it altogether useless after a few years. It was noticed, however, that the ground did not affect the cast-iron pipes at all, but it absolutely ruined those of wrought iron.

The Acting-President said that at Ballarat they suffered a great deal through pipe corrosion. Sometimes not only services but mains were reduced to such a condition that they could be cut through with a penknife; nothing being left but the carbon, and the material becoming like plumbago. One day he examined some ground from which a house had been removed, and found on it blue crystals of sulphate of iron caused by decomposition of iron pyrites coming in contact with some sulphurous body emanating from the mineral water of a mine. Of course, nothing would eat into a pipe quicker than this. The services in Ballarat were always given a good coating of well-boiled tar. If the trouble met with was really bad, one of the best things to do was to use German pipes, such as the Mannesmann tubes, which were sent out covered with layers of hessian soaked in thick pitch, and having over all an excellent coating of bitumen. These pipes were practically everlasting; and where there was very bad ground, it would pay to use them.

The Secretary remarked that the sizes of the Mannesmann pipes varied from 2 to 6 inches in diameter. The covering over them was more like canvas than hessian, and it was coated with pitch; some pitch also being used in the joints. He agreed with Mr. Figgis that they were admirably suited for use in bad ground.

IV.

"Is there any advantage or necessity to fix a governor on the service to an engine where the pressure does not exceed 25-10ths?" "Is the opening in the valve of the ordinary type of gas-bag sufficiently large to supply an engine if the pressure at the meter is 15-10ths to 20-10ths?"

Mr. D. Warren (Footscray) said he personally could scarcely conceive that any argument was necessary on the first question, as his experience went to prove that 25-10ths was the happy medium for a gas supply to an engine, or anything between 20-10ths and 30-10ths, always providing that the service-pipe was adequate for the size of the engine. He considered that a pressure of from 15-10ths to 20-10ths was liable to bring an engine to a standstill for want of gas. Governors, as a rule, were fixed on to services before the gas entered the meter; and, everything being ample, the meter had a momentary spell between every charge. The engine itself was, in his opinion, a governor, and took in its charge at every second stroke of the piston; the bag attached being a reservoir to supply at once the required quantity of gas. Where, then, was the need for a governor? He had never found the inlet and outlet to a gas-bag to be too small to take the necessary amount of gas required; but he had occasionally found that the bag had, from age, lost its elasticity, and would not expand to pressure on the inlet or close as the charge was drawn from it. He had also found the meters sluggish. Inferior gas was often the cause of a gas-engine being brought to a standstill. In his opinion, the gas should never be below from 12 to 14 candles. His reply to the first question was that there was no occasion for a governor, and that the orifice to the gas-bag was always ample. He considered the pressure named in the second question too low.

Mr. E. Tipper (Box Hill) said he was strongly in favour of installing a governor with every gas-engine, for unless this was done the engine had to be regulated to suit each variation of pressure. As to the opening of the valves, he thought this could very well be left to the makers.

V.

"What is the best method of admitting air to revivify oxide of iron in the purifiers for small works?"

The Acting-President said there were two methods of revivifying oxide *in situ*. In one case the lid was taken off, and a small stream of air was directed underneath the grids, and the oxide thus revivified without being thrown out of the purifier. But he took it that the question did not refer to this method of revivification, but to the admission of atmospheric air into the gas. He thought this plan prevailed rather extensively. In small works the difficulty was to take in sufficiently little atmospheric air. Many present would know that if they took in more than 2 or 3 per cent. of air, the illuminating power of the gas would fall considerably; so that a very slight percentage was required. At Ballarat, he used a Roots blower actuated by a water-engine which filled a small gasholder with air. The air then passed through a meter, and was conducted thence to the foul main, where it entered and passed along with the gas to the purifiers. He seldom got beyond 2 per cent. of air. If any of the members were adding to their plant, he would emphasize the necessity of having their purifiers as large as possible. It was seldom that they had a dirty outlet to their third purifier at Ballarat. They had five in action; but two 20-feet boxes did practically all the work. They put about 25 tons of oxide into each of them.

Mr. Beall (Frankston) said he had had trouble with the inverted burners owing to the richness of the gas. He had been recommended to thin it down a little, and also to put in a blower, which had the effect of keeping his purifier clean. The method adopted had stopped all smoke from inverted burners.

Mr. F. Tipper (West Melbourne) said that during the past fifteen months he had been trying several methods of admitting air to the purifiers, and he thought the safest and best way was to add a measured quantity. This could be put in either by a force-pump working continuously or through a small holder. When neither was available, one could make a hole in the outer condenser, to tap which a check-valve would have to be fixed and attached to a meter, and (say) from 1½ to 2 per cent. of air admitted. He had taken in this amount of air without changing his purifier for six months, and put through 9 million cubic feet of gas. When he opened the box, the air appeared to have had a drying effect. There was a little caking on the top; but this method enabled him to use purifiers which without revivifying *in situ* would have been too small.

Mr. H. W. Bean (Warragul) said a very simple way of supplying air to revivify oxide was to connect a 400-gallon tank to the purifying-box, and allow a certain quantity of water to flow into it, which would displace and force a similar quantity of air into the box.

Mr. Taylor (Benalla) said he once had charge of the air plant on a gas-works, and he used to take in from 2 to 2½ per cent. of air; and during tests extending over five weeks, he found that the addition of the air did not reduce the illuminating power of the gas by more than three-quarters of a candle. The air was blown in by steam, and measured by a 50-light wet meter in which oil was substituted for water.

Mr. J. W. Bean (Wangaratta) said he had had a little experience at a gas-works in England in taking in air. An ordinary dry meter was used to measure the inflow; 1 per cent. being admitted at the foul main. When a test was made, he was unable to find the slightest difference in the illuminating power of the gas. The 1 per cent. of air assisted to keep the oxide in good order, and practically doubled its life.

Sulphate of Ammonia in Germany.—According to the report of the German Sulphate of Ammonia Syndicate of Bochum for the past year, the total turnover amounted to 292,217 tons, compared with 176,400 tons in the preceding year; and 99,457 tons of the former were exported, against 60,300 tons in 1909. The favourable development of the inland market for sulphate of ammonia continues. The imports into Germany in 1910 reached 31,400 tons, contrasted with 58,132 tons in the previous twelve months; Austria-Hungary having supplied 18,894 tons of the former, and Great Britain 7105 tons.

Sterilization of Water by Ultra-Violet Rays.—An article in a recent number of the "Electrician" contained some particulars of the working of an improved electric apparatus for sterilizing water. It consisted of a quartz mercury vapour lamp of the Westinghouse Cooper-Hewitt type, run on 220 volts, and taking 3 amperes. During the tests, it worked continuously from the 19th of August to the end of September. The rate of water flow was on an average 25 cubic metres (5500 gallons) per hour. There were eighteen bacteriological tests made on samples of water taken from the two sides of the apparatus. Before sterilizing, the water showed 30 to 300 germs per cubic centimetre, and 50 to 1000 *B. coli* per litre. After leaving the apparatus, only 1 germ per cubic centimetre was observed, and no *B. coli*. This shows that the electric process has a very effective sterilizing action, even when used at such a high rate of delivery. The current consumption has been brought down to the very low figure of 26 watt-hours per cubic metre. Previously-filtered water must be used, seeing that the ultra-violet rays are cut off by any great thickness of cloudy water; while experiments have shown that the water must be quite clear in order to allow the rays to penetrate to the proper depth.

UTILIZATION OF COKE-OVEN GASES.

In last week's "Journal" there appeared a paper read by Mr. Ernest Bury before the Cleveland Institution of Engineers, on the "Bye-Product Coking Process and its Future Development," in the course of which the author dealt with the question of employing coke-oven gas for town illumination. The subject of "Coke-Oven Gases and their Utilization" has also been discussed at length by Mr. G. Blake Walker, M.Inst.C.E., M.Inst.M.E., of the Wharncliffe Silkstone Collieries, in one of a series of Higher Mining Lectures for colliery managers, arranged by the Nottinghamshire and Derbyshire Education Committees, the Midland Counties Institution of Engineers, and the Midland Branch of the National Association of Colliery Managers. The following are the portions of Mr. Walker's lecture in which our readers will be more closely interested.

Very great are the changes which the views of engineers have undergone during the last twenty years on the way in which the heat-values of fuels should be utilized so as to avoid some of the waste which was common under the generation of power from coal burnt under boilers by means of the steam-engine. Evidence given before the Royal Commission on Coal Supplies brought into prominence the very small yield of power which was usually obtained in boilers and steam-engines. Of course, in one sense, there was nothing new in this; but it had been treated as inevitable. What the evidence of the best authorities went to show was that there were possibilities of obtaining a very much larger amount of power out of inferior fuel and from waste heat, which had hitherto been, to a great extent, neglected. It was natural that in a matter of this sort countries which were less bountifully supplied with coal than Great Britain should be the first to take up the problem; and yet it was left (as so often has been the case) for Englishmen to be the pioneers in discovery, and for their discoveries to be neglected at home and taken up by the enterprising foreigner. In pure science, the name of Joule has been immortalized by his investigations into the mechanical equivalent of heat. In 1823 and 1825, Samuel Brown took out patents for a gas vacuum engine. The first to apply blast-furnace gas to motive power in gas-engines was B. H. Thwaite. James Atkinson made important discoveries in the principles of gas-engine construction. Notwithstanding this, England has lagged behind other countries in taking up gas power, so that we are surprised to find ourselves last of all the European Powers in this respect. Germany leads with 46½ per cent. of the total horse power in large gas-engines; America comes next with 32½ per cent.; and Great Britain comes last with 2½ per cent. I think in some quarters, however, we are awakening from our lethargy; for I understand that some large installations are in contemplation which will shortly increase our proportion.

In towns, the gas manufactured for lighting is used (as well as producer gas) for gas-engines, especially where it is cheap, as in Sheffield. Lighting gas has a very complex composition. The following is a typical analysis.

	Volume Per Cent.	Weight Per Cent.	Heat Value Per Cent of Total.
Hydrogen	47·0	7·4	22·8
Methane	31·0	42·8	54·5
Carbon monoxide	9·0	19·9	5·1
Benzene vapour	1·2	7·4	7·7
Ethylene	3·8	8·4	9·9
Carbon dioxide	2·5	8·6	—
Nitrogen	2·5	5·5	—
	100·0	100·0	100·0

Coke-oven gas resembles town gas; but the percentages of hydrogen are usually higher. The two following analyses are of Nottinghamshire brights and Barnsley brights.

	Notts.	Barnsley.
Hydrogen	56·48	52·77
Methane	24·14	24·22
Carbon monoxide	7·29	7·35
Oxygen	0·80	0·80
Heavy hydrocarbons	5·40	5·60
Carbon dioxide	2·70	3·40
Nitrogen	3·19	5·86
	100·00	100·00

These analyses are from laboratory experiments; and the actual gases from any coke-oven battery will differ to a greater or less extent. Most coke-ovens are leaky, and leakages increase the proportion of nitrogen. A coke-oven gas which contains no more than 10 per cent. of nitrogen is quite satisfactory for gas-engine purposes, as the nitrogen merely acts as a diluent.

Steam-Turbines and Gas-Engines.

In a paper read by Professor Herbst at the International Mining Congress at Düsseldorf last year, he referred to a modern plant in which the coke-ovens were arranged in groups of three, only one of which was a bye-product oven; the gases from the other two, besides heating the third (bye-product) oven, being simply used for heating boilers. But since gas-engines have been so greatly improved, as they have been within the last ten years, I need hardly say that to use the waste gases (other than those required for heating the oven-walls) for heating boilers, is not by any

means the best way of getting their value out of them. In an interesting pamphlet issued by Messrs. Haniel and Lueg, of Düsseldorf (and which anyone can obtain by writing to Mr. A. H. Smith, Broad Street House, London), the comparative efficiency of large gas-engines and steam-turbines is very clearly demonstrated. It will be sufficient if we compare a live-steam turbine, driven by steam from boilers heated by waste gases from coke-ovens, with gas-engines driven by surplus coke-oven gas.

In order to make a comparison between a steam-turbine plant and a gas-engine plant, we will assume a battery of 120 ovens, each taking a charge of 6½ tons of dry coal, producing (say) 5 tons of coke per oven. Coking time, about 36 hours. The plant is arranged for bye-product and surplus gas recovery. The surplus gas amounts to about 3530 cubic feet per ton of coal, therefore—

$$\frac{6{\cdot}5 \times 120 \text{ ovens} \times 3530 \text{ c.ft.}}{36} = 77{,}000 \text{ cubic feet}$$

of surplus gas per hour. With a mean calorific value of 407 B.Th.U. per cubic foot, there are about 77,000 × 407 = 31,339,000 B.Th.U. per hour at disposal. On the above assumption, and with a heat consumption of 10,900 B.Th.U. per horse-power-hour, it is possible with gas-engines to produce about 5000 electrical horse power measured at the switchboard. In utilizing gas under boilers for producing steam to drive steam-turbines, with 31,339,000 B.Th.U. and 70 per cent. efficiency, we should produce about 2500 electrical horse power measured at the switchboard. It will be observed that, taking the most favourable result from steam (allowing for superheat) of 12·56 lbs. of steam per electrical horse power (figures which are seldom or never obtained in practice), only half as much electrical power can be produced by burning the gas under boilers and using the steam in turbo-generators as by using the gas direct in large gas-engines.

Messrs. Haniel and Lueg, in the pamphlet already referred to, give a detailed calculation of the cost of a large gas-engine plant with dynamos, and a steam-turbine plant with dynamos. They make the cost of the gas-engine plant for 5000 H.P. £40,000, including a spare engine and switchboard. As to the cost of working, taking 8000 hours a year, the cost per working hour comes out at—

	£	s.	d.
Interest and sinking fund at 15 per cent. . .	0	15	0
Attendance, three men at 5d. per hour	0	1	3
Oil waste, &c.	0	1	7
Working costs and sinking fund	0	17	10
Repairs, supervision, &c.	0	2	8
Total	£1	0	6

Per killowatt hour = 0·064d.

The steam-turbine plant (2500 H.P.) would cost close on £30,000. Sinking fund, 11s. 2d. per working hour; attendance, oil, and stores, 2s.; repairs, 2s.; total, 15s. 2d. Cost per killowatt-hour, 0·093d. Therefore the gas-engine, as compared with the steam-turbine, and utilizing coke-oven gas, supplies electrical energy at a rate 31 per cent. cheaper, and also twice the quantity; so that the gas-engine plant economically considered is 2·88 times superior. The yearly monetary profit of the gas-engine plant works out at about £3684, as compared with the steam-turbine; or, if we work out the calorific value of the gas, and reckon it as the equivalent of boiler coal at 6s. per ton, at about £6760.

It would take us away from our special subject to say anything about what is being done with blast-furnace gas in gas-engines; but I may mention that in the new iron and steel works at Gary, the United States Steel Corporation have installed a gas-engine and electric plant of 40,000 electrical horse power to use blast-furnace gas, and Krupps have 36,000 H.P. from their 26 furnaces.

Coke-Oven Design.

The importance of obtaining the maximum amount of power gas from coke-ovens has induced the designers and patentees of retort coke-ovens to modify their designs so as to obtain the largest quantity of surplus gas possible. The points aimed at in the design of a modern oven are to obtain the maximum heat in the oven-walls, and subdivide the heating gases so as to heat every part of the oven equally, and to shorten the course of the heating gases. Formerly, the air used for combustion was allowed to enter the oven cold; but, of course, considerable waste took place in raising cold air to the necessary temperature. The most effective means are now employed, not only to heat the air, but even the gas. The result is that in the newer ovens the charge is burnt off in a shorter time—25 to 32 hours. This compares with 36 to 48 hours at most plants in England; and it is obviously making a far better use of the plant, and effecting an enormous economy in the amount of gas required for heating the ovens, as also in labour and standing charges. The output of power gas from these improved ovens is, with a rich coal, 50 per cent. or more of the gas given off by the coal—that is to say, a coal yielding 10,000 cubic feet of gas to the ton would furnish 5000 cubic feet to the ton for power purposes. Thus, if 150 tons were coked per day, and 5000 cubic feet per ton were available for power, it would produce over 2000 H.P.

Quantity of Gas Available.

Technical improvements in the coking of coal have made possible the utilization of coke-oven gas for ordinary illumination. The amount of gas so available in Westphalia alone is enormous. A well-known Westphalian Colliery Manager, Herr Förster, of Mulheim, has estimated that 212,000,000 cubic feet of coal gas, of the quality usually supplied by gas-works to their customers, are daily given off and wasted by the coke-ovens of the Ruhr basin. This represents a yearly wastage of over 70,000,000,000 cubic feet of gas, with a value—based on the low figure of about 7d. per 1000 cubic feet—of £2,000,000. As yet only a beginning has been made with the utilization of this enormous store of potential light and power. Of the 92 coke-works in operation in the Dortmund mining district in 1905, only four produced gas for lighting purposes; the output being 63,500,000 cubic feet. In 1907, the number of works was five (out of 94), and the output 99,000,000 cubic feet; and last year the number was eight (out of 96), and their production 876,000,000 cubic feet. The fact that as yet only one in twelve of the coke-works in the Dortmund district disposes of its surplus gas as an illuminant, indicates the vast resources which are still untapped. Obviously, only a small portion of this gas could be used with advantage for lighting; but its conversion into electrical energy opens out boundless perspectives, and to these German enterprise is by no means indifferent.

Gas for Lighting.

The use of coke-oven gas for illumination is making rapid headway. The number of towns in the Ruhr coalfield taking gas from the collieries, either directly or through the medium of companies formed to work this branch of colliery enterprise, is already considerable. In some cases, the entire supply is so obtained, while in others the municipal works buy the gas only in order to supplement the output of their own works, so avoiding the necessity of extensions and renewals, with the attendant heavy expenditure. The first transactions of this kind on a large scale were those between the collieries controlled by Herr Stinnes and the towns of Essen and Mulheim, which began by buying coke-oven gas direct, in order to mix it with that produced in their own works, to which it proved quite equal in quality. So successful was the experiment, that these two towns have since decided to close their gas-works and depend entirely on colliery gas.

The contract of the Municipality of Essen is with the Victoria Matthias Colliery Company, acting in the name of other colliery companies, and is to run at least ten years. Colliery gas will be supplied in bulk in any quantity needed at the price of 8½d. per 1000 cubic feet; and in consideration of the town's works being discontinued, the Colliery Company undertake to take over, at the existing salaries and wages, all officials and workpeople not required in future by the Essen Gas Department. The contract will come into operation this April; and at the end of the ten years, the town will have the right to continue it for an equal term. Similarly, the adjacent town of Bochum has agreed to discontinue its gas-works and receive its supply from Krupps' Hannibal and Hanover collieries, and the same thing has been done by Gelsenkirchen. Seven other towns have closed down their works, and five are about to do the same; while many others are negotiating with collieries in order to substitute coke-oven gas for that produced in gas-works.

The Municipalities of Barmen, Velbert, and Heiligenhaus have concluded contracts with Thyssen and Co., of Mulheim, covered by the guarantee of the Deutscher Kaiser Colliery Company at Hamborn, near Duisberg. The Barmen contract will take effect as from April 1, 1911, when the municipal works will be closed down. The arrangement secures to the town an immediate gain in two ways—on the one hand, it is to receive a minimum profit of £5000 a year; while, on the other hand, it is saved the rebuilding of its existing works, which would otherwise have been necessary, and would have cost some £100,000. Barmen will need a supply of 600,000,000 cubic feet yearly. The contract is for 25 years; and the price ranges from 1s. 3½d. to 1s. per 1000 cubic feet. The gas has to be conveyed over 30 miles; but communes on the way are also supplied. It has been estimated that the cost of conveying gas to Barmen over this distance, including interest, depreciation, repairs, and establishment charges, does not exceed 3½d. per 1000 cubic feet. The contract with Velbert is for 25 years, and provides for a sliding-scale of prices varying with the price of coal; but the price will always be lower than the past cost price of producing gas at the town's works. Velbert reserves the right to retain its own works and to return to them in certain circumstances.

Some Prospective Schemes.

At the present time, an Essen enterprise, behind which is Herr Stinnes, is in negotiation with a number of towns and villages of the Berg country beyond Barmen, with a view to supplying them with colliery gas. With the object of developing this important branch of gas engineering still further, a scheme is being promoted for the establishment of a large generating station, from which, if needful, the whole of the industrial district of Westphalia could be supplied. A number of towns have given a provisional promise to discontinue their gas-works, and the execution of the scheme will be taken in hand directly the adhesion of a sufficiently large network of towns can be obtained. It is proposed to set up coke-works with huge receiving chambers both at the eastern and western ends of the district, and from these to convey the gas by a system of main-pipes to central distributing works. It is expected that gas will be supplied to the communes at the price of 1s. per 1000 cubic feet, leaving them an ample margin for profit on sale to their local consumers.* The same

* Some particulars of different schemes referred to by the author were reproduced from the "Frankfurter Zeitung" in last week's "JOURNAL," p. 921.—ED. J.G.L.

movement is in progress in the Saar coalfield, where the Stumm Collieries supply the town of Saarbrücken with coke gas, and in the Waldenburg district of the Silesian coal-basin. The Upper Silesian Central Gas-Works, established by the Bismarck Smelting Works Company, have some 38 miles of gas-pipes, and compete successfully with the large electrical works in that district.

For the present the large municipalities equipped with thoroughly modern plant cannot be said to have been seriously menaced by this movement, even when situated on the outskirts of a coalfield, like Cologne and Düsseldorf. Not only has the introduction of vertical retorts and other recent improvements rendered great economy possible in the cost of production, but these towns are effectually protected by the trade monopoly which they enjoy within their administrative areas. Where a town lies far away from the coal measures, like Berlin—which supplies gas to various small communes many miles from its boundaries north and east—it may be a considerable time before the long-distance transport of colliery gas will benefit the great mass of consumers. Nevertheless, the question of bringing this gas within reach of all the large centres of population is largely one of the initial expense. The gas exists in virtually unlimited amount, and can be remuneratively marketed at the mere cost of collection and conveyance.

Possibilities of the System.

It is not difficult to realize the enormous possibilities of which this system of gas and electricity supply is capable. From the technical standpoint, there is no reason why the two great coal and iron districts of Germany—Westphalia and Silesia—should not be able to supply at least a large part of the country with all the power and light needed for industrial, domestic, and public purposes. As regards gas, instead of every town and village importing coal from distant collieries in order to produce its own illuminant in comparatively small quantities uneconomically on the spot, the supply would be obtained from central receiving and distributing works, conveniently situated, linked-up with the producing collieries. All the advantages of production on a large scale would, in this way, be secured, to the great gain of the consumers; while the familiar experience of prices varying by from 50 to 100 per cent. in contiguous areas of supply would cease to exist. The immense saving in the transport of coal alone would soon pay for the cost of laying down the necessary plant and mains; but the economy effected both in capital and labour by restricting the functions of local authorities to the work of distribution would also be enormous.

As to electricity, corresponding advantages and economies would be offered, both to industrial and domestic consumers, by the substitution of large central plants, producing at the minimum cost, for innumerable small ones producing inefficiently and expensively. The idea of thus revolutionizing the gas and electrical engineering industries is a big one. But big minds are working at it; and it would be unsafe to regard its eventual realization as chimerical or even doubtful.

The Gas-Engine Industry.

To the mining engineer a still more interesting way of utilizing coke-oven gas is, of course, by converting it into power, and through the medium of electricity applying this power either to the purposes of the colliery itself, or for the generation of power for sale. The gas-engine industry has of late made great strides in this country; and a number of makers have attained to great eminence in this branch of engineering.

[This portion of the lecture was devoted to a description of various types of gas-engines and their workings.]

Summary of Conclusions.

I have endeavoured to point out that, in the coking of coal there is an immense quantity of potential power which has hitherto been wasted, but which we are beginning to turn to account. This is to be accomplished by coking the coal in ovens of such design that the minimum quantity of the occluded heating gases should be used for the actual coking process, and the maximum quantity saved for illuminating or power purposes. We have seen that the design of ovens is being modified to secure this end, and that 50 per cent. or more of the heating gases can be applied to these latter purposes. On the basis of present prices, and putting the gas at the low value of 6d. per 1000 cubic feet, we find that a ton of coal coked should leave a net value of 8s. 6d. per ton.

	s.	d.
Value of 14 cwt. of coke at 11s. per ton	7	8
Value of sulphate and tar (say)	2	0
Value of 5000 cubic feet of (illuminating or power) gas at 6d.	2	6
	12	2
Less cost of manufacture	3	6
	8	8

say, 8s. 6d. per ton. At a colliery where small coking now leaves a loss, there should therefore be, after allowance for washing and other charges, a fair margin on the cost of production.

I have pointed out that there is great scope for the supply of coke-oven gas in bulk both for illuminating and power purposes, and that the day is not, perhaps, so far distant when large organizations will be formed to deal with the supply of power gas, or electricity generated by power gas, on a gigantic scale. Central power stations have long been talked of. The electrification of railways is in the air. There is nothing to prevent the railways from using cheap coke-oven or producer gas in order to obtain cheap electricity. This, however, will not be yet awhile. But what is at our doors, and what must appeal to each one of us, is the utilization of our own coke-oven gases to reduce our colliery consumption by generating cheaply from our waste gases electricity for pumping, haulage, coal-cutting, even winding. To accomplish this, gas-engines must take the place of steam-engines.

Very marked progress has been made during the past year in the application of the Mond process to the gasification of all kinds of combustible matter, and particularly fuel previously regarded as waste. Another important development lies in the utilization of colliery waste, belt pickings, &c.; and we are now erecting a producer-gas plant with bye-product recovery to deal with 320 tons per day for power purposes, and for gas-firing boilers at the Birchenwood Colliery, in Staffordshire. To deal with the very high percentage of ash (40 per cent.) in the mixture, a mechanical ash-removing arrangement has been incorporated in the Mond producer in this case, and will effect large savings in labour, and at the same time produce a gas of uniformly high heating power. This will be the largest gas-producer unit in the world. The Power Gas Corporation demonstrated, in bulk trials, the commercial success of gasifying coke ballast, an otherwise waste fuel, consisting of the small screenings and sweepings up, &c., from coke-oven batteries, and containing as much as 30 per cent. of ash. From such fuel, they have made a gas of 110 B.Th.U. per cubic foot, and at the same time have recovered 70 lbs. of sulphate of ammonia per ton; and we look for very considerable developments in this direction in the near future.

GAS-PRODUCERS.

A lengthy paper on "Gas-Producers," by Mr. W. A. Tookey, was the fare provided for the members of the Association of Engineers-in-Charge at their last monthly meeting. The value of the contribution was considerably enhanced by the inclusion of a number of illustrations of different types of plant. Mr. Dugald Clerk occupied the chair; and there was, as is usual at the gatherings connected with this organization, a large attendance of members.

Remarking that it was in 1881, at the York meeting of the British Association, that Mr. J. Emerson Dowson first introduced his apparatus for generating producer gas economically and continuously, and demonstrated its possibilities by driving a small gas-engine, Mr. Tookey said this demonstration was actually the birth of the gas-producer for the purposes of power generation, and was the outcome of experiments following the principles propounded by Mr. Dowson three years previously.

Five years earlier, Nicholas Otto had produced his gas-engine, which was destined to mark the commencement of a new era in the construction of internal-combustion engines. Though marked success had been achieved, the gas-engines set to work were but of small power; the largest being capable of developing 12 H.P., or thereabouts. In 1881, the efforts of many engineers were being concentrated upon the problems of the gas-engine, and especially in connection with the production of a machine which would be distinct from that covered by the Otto patents. Foremost of these engineers was Mr. Dugald Clerk. In that year, he produced a gas-engine working upon the two-cycle principle, with the introduction of which his name would ever be remembered. In later years, and under more favourable conditions, Mr. Clerk's ideas had been brought to a successful issue commercially; and some of the largest gas-engines of to-day worked on the cycle of operations first propounded by Mr. Clerk.

Looking back over the intervening years, they could recognize how the development of the gas-producer and that of the gas-engine had been interdependent. Improvements in gas-engine design had enabled the merits of producer gas to be fully realized; and the improvements in gas-producer design had enabled the field for gas-engines to be extended very considerably. They could also see how much gas-power engineers owed to the excellent qualities of the fuel distributed by the various gas undertakings. The complexity of the problems involved in gas-engine construction had been serious enough, even with gas available of such uniformity of composition. With an ever-ready supply of gas of uniform quality, the gas-engine maker had been able to improve his machines in a way that would have been impossible unless such fuel had been ready to hand. Of practically uniform composition and calorific value, being readily available in any quantity at any hour of the day or night, of a richness which enabled small pipes to be used for its distribution, there was little doubt that, if it were possible to purchase town gas at a price comparable with competing fuels, few users of power in units of moderate size would deem it necessary to instal separate gas-making apparatus, with all that it entailed. Even to-day, in many instances, it would be found that the advantages were on the side of the town-gas service, when proper consideration had been given to all the questions that arose in connection with power generation in towns, and especially for moderate powers, variable loads, and intermittent operation. It should be remembered, in this connection, that it was not so much the rated power of the engine that mattered as the actual power demanded by the normal factory loads. But while there was a field for gas-engines served by

town gas, there was a much larger one for those that could be fed with gas generated from poor fuels at low cost—more particularly from material that would otherwise be a waste product of manufacture, and possibly entail expense for its removal. When gas engines and producers came into world-wide prominence eight or ten years ago—following the introduction of the "suction" type of gas plant—there was no difficulty in demonstrating that a very considerable reduction in cost of power generation could be obtained by the supersession of the steam-engines and old-type town-gas engines previously in use in favour of up-to-date gas-engines and suction-gas plants.

The process of gas manufacture in producer plants was essentially simple, and was similarly carried out in all types of apparatus; but considerable modification of detail was required in order to obtain satisfactory operation with fuels of various characteristics. The ideal fuel for gas production was one that was composed almost entirely of pure carbon, with a small amount of ash and very little moisture or volatile matters. From the first, the most favoured fuel had been Welsh anthracite—this being the nearest approach to the ideal fuel. Scotch anthracite had been much used, as this had often been the more readily procurable at reasonable prices; for though containing a rather higher percentage of ash, the carbon content had been high, and the volatile constituents low. Gas-works coke came next in favour; but it had not been used so extensively as it should have been, owing to the considerable proportion of volatile matters that had not been entirely driven off in the process of coal-gas manufacture. This had necessitated additional details for the adequate cleaning of the gas, and the consequent more frequent cleaning of the pipe-connections and tar-separators. Owing to the higher ash content, also, the fuel had on the whole given inferior results to anthracite, without the compensation of adequate reduction in working costs. Charcoal had proved to be an excellent fuel for gas production; for its porosity and freedom from tendency to clinker enabled an excellent gas to be obtained with a minimum of attention and at a reasonable expenditure. Pointing out that some modifications were required to the ordinary anthracite producer when charcoal and gas-works coke were used for fuel, the author described the Tangye suction-gas producer for charcoal, as well as the Tangye tar-separator—an auxiliary piece of apparatus to the scrubber, frequently found to be necessary for removing tar from gas made from coke or charcoal, in consequence of imperfect carbonization. Next reference was made to some of the disturbances occasionally found to render the working of a producer irregular, fitful, and unsatisfactory.

Another branch of the subject dealt with by Mr. Tookey came under the heading of "Gas-Producer Rating." The rate of gasification, he remarked, varied greatly; and different makers took advantage of the elasticity of the gas-producer in this respect. First and foremost, the deciding factor was the quality of the fuel, its size and porosity, its density, and its tendency to form clinker. Naturally, the most liberal rating was applicable to anthracite plants, and particularly those which were only occasionally required to furnish gas for heavy load demands for but a short period of time. Assuming the best of conditions, good coal (freedom from clinker, little ash, of fair and uniform size), with an engine having but a single cylinder governed on the hit-and-miss principle, and with ample water vaporizing capacity in the producer, as much as 36 lbs. of fuel could be burnt per hour per square foot of cross sectional area; or, stated in another way, every 4 square inches of cross sectional area would gasify 1 lb. of anthracite per hour—sufficient to provide gas equivalent to the generation of 1 B.H.P. But this very probably represented the practical limit of gasification, inasmuch as the velocity of the blast through the fire coincident with this rating would be very great, encouraging the formation of clinker, and cores or blow-holes through the fuel-bed, with consequent formation of poor gas. The particles of dust from the top of the fuel-bed would probably be drawn over with the outgoing gases, and thereby cause an accumulation to form in the connections, which would bring further trouble. With a rate of gasification as high as this, it was essential that the fuel-bed should be of ample depth, so that, in spite of accumulation of ash or clinker difficult or impossible of removal during the operation of the producer, there would still be a sufficient depth of fuel to ensure the due conversion of the whole of the entering blast. A more suitable rating, and one that gave good all-round satisfaction when dealing with different qualities and sizes of anthracite, was one of 24 lbs. of coal per hour per square foot of grate area. This was equivalent to 6 square inches per pound (or horse power) per hour. With coke, broken small, it was not advisable to exceed 18 lbs. per hour per square foot (8 square inches per pound, or per horse-power-hour). With fuels of poorer quality, experience had shown that gasification at the rate of 12 lbs. per square foot per hour was quite fast enough. At the other end of the scale, the slowest rate of combustion permissible was about 5·5 lbs. per square foot per hour, but this only when the contour of the internal lining had been shaped to retain a core of fuel at one portion of the combustion chamber at high temperature, and thus, by concentrating the combustion at this point, ensuring that the surrounding and superimposed fuel could be heated by conduction to the temperature required for the completion of the chemical processes involved. With poor anthracite of small size, when gasified to serve quick-revolution multicylinder engines, it had been found that a suitable rate had been from 9 lbs. to 10 lbs. per square foot of mean sectional area of the furnace per hour. This was equivalent to from 15 to 16 square inches per pound or per horse-power-hour. All these figures referred to the mean sectional area throughout the depth of the fuel-bed.

One invention which the author described, and which he remarked was a novelty, was the Marconnet producer intended to utilize bituminous coal dust. By means of this apparatus, he said, it was claimed that all irregularities of operation due to different qualities of coal were entirely obviated; it being of no consequence whether the fuel were coking or not, nor even if of excessively high ash content, so long as it was finely powdered by previous treatment. Small coal that was almost worthless, and might be purchased at low prices, could be utilized by first passing it through a crusher such as was used for similar purposes in cement works—an operation that cost but little. Another advantage that was claimed for the coal-dust producer was the high rate of combustion that could be attained, amounting to as much as 100 lbs. to 160 lbs. per square foot of sectional area. This not only reduced to a minimum the floor-space required, but also rendered it possible to construct producers in units of 1000 to 5000 H.P. A coal-dust gas-producer capable of generating gas to serve a 600 H.P. engine, together with its accessories, required a floor-space of only 10 ft. by 6 ft. by 10 ft. high. There were also included in the paper particulars of the Wilson power-gas plant, the Kupferberg producer, and the Kerpely producer.

A good discussion followed some opening remarks of Mr. Dugald Clerk, who said the most important development of recent years in connection with gas-engines was the bringing forward of the suction producer. Before the suction producer came into active use, they were confined very largely to coal gas for moderate sized gas-engines. As the author had very well stated, coal gas was the best fuel they could have for a gas-engine; and if they could obtain the gas sufficiently cheaply, producers would not find their way to any large extent into cities. The coal-gas people were beginning to be alive to this fact; and for the purposes of an exhibition which was to be held, the National Gas-Engine Company were now building three very large engines to be run on coal gas. As a matter of fact, at the present time they had on the works a 750 H.P. engine for which coal gas was used. They could get the highest possible thermal efficiency; but, of course, for running large engines like this it was necessary to obtain the gas at a very cheap rate. Some years ago, at a meeting of the Gas Institution, he delivered an address upon the subject of large gas-engines; and he pointed out then that it was the duty of the gas industry, in the interests of the country at large, to produce coal gas of 500 to 550 B.Th.U. per cubic foot, at the price of 1s. per 1000 cubic feet. Now there were several cities in Great Britain where town gas was sold at not more than 1s. per 1000 feet. One of these was Widnes, and another was Sheffield. In addition, there were a number of places where the gas was sold, for motive power purposes, at between 1s. 6d. and 1s. If coal gas of the thermal value he had mentioned could be had at 1s. per 1000 cubic feet, the producer would be practically banished from cities, up to (say) about 100 H.P.; but above this size, the producer would again come in. The use of the suction producer especially had proved an effective argument for those of them who were now building gas-engines to convince gas-supplying authorities that it would be better to reduce the price of gas; and he thought to a great extent the engine constructors would be indebted to the suction producer for the increased use of gas-engines. There were many suction producers; but, of course, when it came to a very large engine it was desirable to have a pressure producer using bituminous fuel. Many attempts had been made to employ coal dust in producers; and the arrangement referred to by Mr. Tookey seemed to be a promising one. He congratulated the author on his paper.

The Director of Municipal Works at Lille has been so impressed with the installation of high-pressure gas lighting on the Graetzin system in Paris, to which reference was made in the "JOURNAL" last week, that he has obtained particulars in regard to it, and has proposed to the Municipality to adopt similar lamps for the lighting of certain parts of the city.

Convened by Mr. W. B. M'Lusky, of Perth, the "Informal Meeting of Scottish Gas Managers"—the twenty-eighth since the inauguration of this annual function—will be held to-morrow (Wednesday) at the Windsor Hotel, Glasgow. The Chairman, Mr. J. B. Scott, of Cowdenbeath, will read an address at 1 o'clock. No formal papers will be presented; but those attending are invited to introduce questions of interest for discussion. The meeting will be followed by a dinner at 4 o'clock.

At the offices of the Ipswich Gas Company on Monday last week, the Company's staff bade farewell to one of their number—Mr. F. Arthur Last—who has been appointed Secretary and Manager to the Halstead Gas Company. Mr. J. T. Jolliffe, the Engineer, Manager, and Secretary of the Ipswich Gas Company, presided, and referred in high terms to Mr. Last's industry and ability; remarking that while his colleagues were sorry to lose him, they were pleased that he was moving a step higher in his profession. In their name, he asked Mr. Last's acceptance of a fumed oak roll-top desk, as a token of their good wishes for his future welfare. Mr. Frank Prentice, the Assistant-Engineer, added a few words by way of endorsement. Mr. Last, in thanking the staff, said he should always have pleasant memories of the time spent with the Ipswich Gas Company. He added that he desired specially to thank the heads of the departments for their kind and willing assistance, which had enabled him to take the position he was about to occupy.

CARBONIZING PLANT AT PROVIDENCE (R.I.).

Installation of Dessau Vertical Retorts.

At the Annual Meeting of the New England Association of Gas Engineers, held at Boston, the new works of the Providence (R.I.) Gas Company were the subject of two papers—one by Mr. J. W. Ellis, the President of the Company, and the other by Mr. Carroll Miller, the Engineer. The paper by the last-named gentleman dealt more particularly with the plant, which comprises a setting of vertical retorts on the Dessau system. The following portions of the paper describe the carbonizing arrangements.

Beginning with the coal storage and handling plant, on the water front of the Providence River there is a sea-wall built of stone masonry. It is 325 feet long; and the depth of the water alongside is 26 feet at high tide. The coal bridge has a capacity of from 100 to 150 tons per hour. A two-ton bucket is used with this apparatus. One leg of the bridge runs on the sea wall, and the span from this point to the other leg is 211 feet. The trolley travel is 304 ft. 6 in.; and the total length over all is 324 ft. 6 in. The clearance of the bucket above the ground is 56 feet. The longitudinal travel of the bridge is 220 feet—giving an outside storage area for coal of 220 ft. by 201 ft. The coal-shed, which has a capacity of about 8000 tons, is filled from the bridge through hatches in the roof; or the coal may be dumped direct into the hopper, from which it is taken by conveyors into the retort-house. For reclaiming the coal from the shed, two Dodge telphers are used, one running on each side of the shed. They are equipped with two cubic-yard buckets. The shed is entirely constructed of concrete and steel.

From the hopper already mentioned the coal passes through a weighing-hopper, thence to an apron conveyor which feeds the crusher. From the crusher the coal is raised in a bucket elevator dumping on to a belt conveyor which feeds the bins. All machinery from and including the weighing-hoppers to the bucket elevators is in duplicate. The capacity of each set of conveyors is 75 tons per hour.

The retort-house is designed for four stacks, each containing six benches of ten retorts. At present, three stacks have been built, two in the south side of the house and one in the north. The house, which measures 215 ft. by 80 ft., is of German design, and is built of steel with 8-inch brick curtain walls. The retort installation is of the Dessau type, and furnished by the Didier-March Company. The retorts are 13 ft. 2 in. long, 22½ in. by 9 in. at the top, and 27 in. by 14 in. at the bottom, and are designed to carbonize about 70 tons of coal per stack per 24 hours. There is one producer for each bench; the size of the grates being 3 ft. 4 in. by 4 ft. The total depth from the grate-bars to the charging-door is 18 feet; but as the producer gas is taken off at a point about 3 feet above the grate, the figure represents the effective fire depth—the remainder of the height being available for storing coke. The producers of the first two stacks are equipped with ordinary bar grates; but those of the third stack, which was contracted for nearly a year after the others, have "step" grates.

Coal-hoppers are located above the benches, and extend the entire length of the house. These hoppers will store sufficient coal for 36 hours' operation. The coke and breeze bins are located at the west end of the house. Breeze, which is used for filling the bottom mouthpieces of the retorts, is charged with a measuring hopper suspended from an overhead track. The coal is measured in a similar hopper. Coke for charging the generators is conveyed from the bins in a hopper likewise suspended.

The coke is discharged from the bottom of the retorts into a shoot, and thence to a coke-conveyor. There is a line of conveyors on each side of the house, and located to one side of the retort-stacks, in order to keep the steam given off by quenching from ascending through the retorts to the charging-floor. These conveyors are of the De Brouwer type. The coke is quenched in the conveyor trough, and carried along to the end of the retort-house, where it is dumped into an automatic skip hoist, which in turn discharges into a storage bin having a capacity of 14,000 cubic feet. Coke for charging the furnaces is taken up in cars on a platform elevator at the west end of the retort-house.

The skip hoist and storage bin are of the same design as those in similar plants in Germany; the hoist being inclined at an angle of about 45°. There are two cars connected by wire ropes, one car going up full and the other descending empty, passing one above the other at the middle of the incline. At each shoot of the coke-bin there are screens to remove the breeze, which is collected in a hopper lower down. Coke may be loaded from the bin direct to cars and waggons. A Dodge telpher running on a steel trestle, the tracks being 54 feet above the ground-level, takes the coke from the bin in a bottom-drop bucket, having a capacity of 160 cubic feet, and conveys it to the screening plant or to the store. Something over 5000 tons can be stored, and the track system can be extended to increase the storage to any desired extent. The coke is fed into a hopper at the top of the screening building, thence through a roll-crusher and on to a shaking screen, From the bins, the coke may be sent through shoots into waggons or narrow-gauge cars. There are bagging shoots under the bins. Coke is reclaimed from stock with the same telpher equipped with a 2½-ton bucket. A Hunt narrow-gauge railway runs from the coke-bin and screening plant to the platform elevator and boiler-house.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Vertical Retorts and Chamber Ovens.

Sir,—With reference to an article in your issue of March 14, under the heading "Vertical Retorts and Chamber Ovens," it is stated that no Munich chamber oven contracts were arranged during the period between Jan. 1 of last year and (presumably) the date of the compilation of the article, which purported to be a list compiled with the assistance of the respective contractors.

For the information of your readers, and the compiler of the article, we may state that orders have been placed for Munich chamber furnaces within the period mentioned, as follows:—

La Société du Gaz de Paris, for their La Villette Gas-Works, 32 Munich chamber ovens, having a daily capacity of 5,651,000 cubic feet of coal gas.

For Rome (repeat order), for 12 ovens of a capacity of 2,550,000 cubic feet of gas.

For Leipzig (repeat order); 8 Munich chamber ovens of a capacity of 2,000,000 cubic feet per day.

The above make, in the aggregate, upwards of 10 million cubic feet of gas per diem.

We are of opinion that these installations are of a size which should not have been ignored by the compiler of the article referred to.

The Coke-Ovens and Bye-Products Company, Limited,
Sole Agents for the Erection of Munich Chamber
Furnaces for Great Britain and the Colonies.

St. Stephen's House, S.W., March 27, 1911.

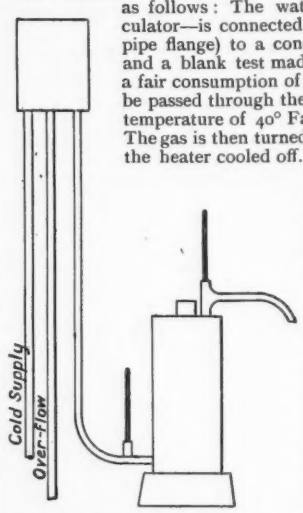
Water-Heating by Gas.

Sir,—As makers of gas apparatus, we have been much interested in the recent correspondence that has appeared in your columns with reference to water-heating by gas.

To us the whole of the controversy seems due to the fact of there being no general standard among gas apparatus manufacturers and gas companies, whereby water-heaters can be tested for comparative efficiencies. This being the case, the following method, which is an easy and accurate one for the purpose, might be of assistance to those who often have to ascertain the comparative capabilities of water-heating appliances of different manufacturers.

Those who have made comparative tests of circulators connected up to pipes and cylinders, as usually arranged for domestic use, must have noticed the variations which occur from time to time with the same installation, due chiefly to an increase or decrease in the temperature of the laboratory. It is quite obvious that with an unlagged cylinder (and most tests are carried out in this way), with the large amount of surface open to radiation, some difference in the final results is sure to arise.

The method we would suggest, and which we ourselves practise, is as follows: The water-heating apparatus—*e.g.*, a circulator—is connected at the inlet (that is the return-pipe flange) to a constant head of water [see sketch], and a blank test made to ascertain approximately, with a fair consumption of gas, the amount of water that can be passed through the heater and raised to a constant temperature of 40° Fahr. above the inlet temperature. The gas is then turned out; the water kept flowing; and the heater cooled off. When the latter has resumed its normal temperature, the difference in readings between the inlet and outlet thermometers is noted. The gas is again lighted; the consumption of gas and the flow of water remaining as before.



During the period of test, the calorific value of the gas is frequently ascertained. When the water from the heater has reached a constant temperature, the difference between the inlet and outlet thermometers is carefully observed, and the flow of water per minute is recorded, by noting the time taken to collect a measured volume and calculating from this result the flow of water per hour. The following factors having been obtained, namely—

A, the difference between the temperature of the inlet and outlet water, due to the temperature of the laboratory;
B, the difference between the temperatures of the inlet and outlet water, due to the gas that is being consumed;
C, the gross calorific value of the gas;
D, the amount of water flowing through the heater, in pounds per hour;
E, the consumption of gas per hour—

$$\text{the percentage efficiency} = \frac{D \times (B - A) \times 100}{E \times C}$$

It has always been our practice in calculating the comparative efficiencies of either our own or other makers' water-heaters to do so on the gross calorific value of the gas.

Richmond Gas Stove and Meter Company, Ltd.

Warrington, March 29, 1911.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bill read a second time and committed: Felixstowe and Walton Water Bill.

Bill reported: Enfield Gas Bill.

Bills read the third time and passed: Ashborne and District Gas Bill, Chesham and District Gas Bill, Ely Rural District Water Bill, Hastings Corporation (Water and Finance) Bill, Swinton Urban District Council Bill.

The Bedwellty Urban District Council Bill and the Whaley Bridge Gas Bill have been withdrawn.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills brought from the Lords, read the first time, and referred to the Examiners: Ashborne and District Gas Bill, Chesham and District Gas Bill, Ely Rural District Water Bill, Hastings Corporation (Water and Finance) Bill, Swinton Urban District Council Bill.

Bills reported, with amendments: Ipswich Corporation Bill, London County Council (General Powers) Bill.

Mr. Dawes, Mr. Hastings Duncan, Mr. Ingleby, and Mr. Stanier were last Tuesday nominated members of the Joint Committee on the Metropolitan Water Board (New Works) Bill and the Thames Conservancy Bill, whose sittings commenced the next day, as is recorded elsewhere.

WINCHESTER CORPORATION (ELECTRIC SUPPLY) BILL.

The Gas Company's Opposition.

HOUSE OF LORDS COMMITTEE—Thursday, March 23.

[*Before Lord* SOUTHWARK, *Chairman*, *Viscount* FALKLAND, *Lord* GWYDYR, *Lord* WILLINGDON, *and Lord* DE MAULEY.]

In this Bill powers are sought by the Corporation of Winchester in relation to their acquisition of the undertaking of the Winchester Electric Light and Power Company.

Mr. BALFOUR BROWNE, K.C., and Mr. KEEN appeared for the promoters; Mr. HONORATUS LLOYD, K.C., and Mr. A. M. PADDON represented the Winchester Water and Gas Company, who petitioned against the Bill.

Mr. BALFOUR BROWNE, in opening the case for the promoters, said that in the year 1895 the Corporation applied for a Provisional Order to enable them to supply electricity. They obtained their Order; and the complaint of the Winchester Gas Company, who were the only opponents of the Bill, if it had been made at that time, might possibly have been heard. But he thought their Lordships would agree with him that the opposition was rather belated when the Corporation were only seeking to buy back from the Winchester Electric Light and Power Company the powers they transferred to them in 1897. Having got the Order in 1895, the Corporation transferred the powers to the Electric Light Company for a period of 42 years. In the deed of transfer, there was a clause which gave the Corporation the right, on giving twelve months' notice, to purchase the undertaking from the Company. After the Provisional Order was obtained, the boundaries of the city of Winchester were extended; but the limits of electrical supply remained unaltered. In January, 1910, the Corporation determined to give notice to the Company that they were going to purchase. The Company put in a claim for £99,736 as the amount they had expended; but Mr. Charles Mertz, the Electrical Engineer consulted by the Corporation, advised that the price ought not to exceed £91,000. The Company had only the right to supply within the limits of the original city of Winchester, and not in the area added to the city by the Winchester Order of 1900. But nevertheless they had laid their mains in the extended area, and were supplying electric light and power. It was well known that gas companies and electric light companies did a large amount of free piping and free wiring. The Corporation had no power to purchase this wiring or piping; but as they intended to supply this extended area, they were going to get the advantage of it. The free wiring alone cost £15,000. The profits of the undertaking were £7060 per annum. The Council would borrow the £91,000 at 3½ per cent., and the interest and sinking fund would amount to £4246 per annum. The Council proposed to confine their new area to a radius of two miles round the city. The promoters asked for statutory powers to borrow £91,000. The only people who dissented were the Gas Company. In their petition, the Gas Company complained that "by clause 39 of the Bill the Corporation ask power to appoint and pay auditors, in addition to those appointed under the Municipal Corporations Act, 1882." In clauses 13 and 14 of their petition, the Company stated that they were the authority for the supply of gas and water in the whole of the area within which the Corporation sought to supply electricity. The petitioners also alleged that the Company were improperly supplying electricity outside their statutory area. This was quite true. In clause 18, the Gas Company submitted "that the promotion of the Bill is unnecessary, and is an unjustifiable expenditure of the ratepayers' money, and contrary to the practice of Parliament. . . . All the powers required by the Corporation for effectuating the purchase of the Company's undertaking could have been obtained by a Provisional Order under the Electric Lighting Acts, 1882 to 1909. The cost of obtaining such a Provisional Order would be considerably less than the cost of promoting the Bill." In answer to this, he would only remind their Lordships that the ratepayers had approved the Bill. The Corporation could not have purchased the undertaking in the extended area without coming to Parliament. The petitioners next stated that they were the second largest ratepayers in the city, but, notwithstanding that they were so injuriously affected by the Bill, they were not entitled to vote at the meeting of ratepayers. Of course, as ratepayers they were bound by the action of the Corporation. The petitioners strongly object to the proposal of clause 16 and the first schedule of the Bill, "whereby the Corporation seek powers to supply electrical energy in a large area outside the city of Winchester, in almost the whole of which your petitioners are authorized to supply, and do supply, gas." He might object to the *locus* of the Company; but he did not want to do this. He desired that the matter should be fully discussed before the Committee, and therefore he had not objected to their *locus*. In clause 21, the petitioners said that if the Corporation were authorized to supply electrical energy in the petitioners area beyond the city, the Company would be subject to most unfair competition. In clause 33, the Gas Company contended that the expense the Corporation would be put to in providing a supply of electrical energy in the proposed area beyond the city would involve them in a loss, so that the result would be not only to deprive the petitioners of customers, but, by making good out of the rates of the city (to which the petitioners were the second largest contributors), the Corporation would be able to compel the petitioners to contribute towards the maintenance of the competition to which they would be subjected. There was, Counsel said, no chance of a loss. The present income of £7060 would more than pay the debt-charges; and instead of there being a loss to the ratepayers, they would make money by it. The whole objection of the Gas Company meant: "You are going to compete with us." This objection should have been raised in 1895, when the Corporation got their Electric Light Order. The petitioners also submitted that the period of 45 years for the repayment of the money borrowed was much too long. The only other thing he need read was clause 27, which was: "Your petitioners further object to the powers sought by clause 40 of the Bill, which will enable the Corporation to allocate expenditure which should properly fall on their electricity undertaking to other of their undertakings, and thus enable them to make the electricity undertaking appear to be self-supporting, while it is in fact not so."

Mr. *Charles Mertz* then gave evidence on behalf of the Corporation. He estimated the amount the Corporation should pay for the undertaking was £90,665, *plus* 10 per cent.; making in all £91,000.

Friday, March 24.

On the resumption of the proceedings this morning, further evidence was heard on behalf of the promoters.

Mr. *J. S. Finley*, the Mayor of Winchester, examined by Mr. KEEN, said that, as a shareholder in the Electric Light Company, he took no part in the negotiations for the purchase; but he thought the terms arrived at represented a fair bargain.

In cross-examination by Mr. HONORATUS LLOYD, witness admitted that in purchasing the electricity undertaking they would be going into competition with the Gas Company with the rates behind them. The Corporation Electricity Committee had been advised that the capital expenditure was exceptionally high, having regard to the works provided. The capital expenditure was said to be £89,940. He could not say who advised the Committee that the amount was excessive. They were given to understand that they would obtain better terms from Parliament than they would get from the Local Government Board. They wanted to spread the loan over as long a period as possible in the interests of the ratepayers. They thought that if they could spread it over a greater number of years, they would be able to supply electric light cheaper.

Mr. *A. Edmeads*, a member of the Electric Lighting Committee, said he considered that the acquisition of the undertaking would be a great advantage to the city and the ratepayers. He was satisfied that the price arranged was fair and reasonable. He did not believe the purchase would involve any charge upon the rates. He had always looked upon the opposition of the Gas Company as arising from their fear of competition. They thought that the competition would be stronger in the future than it had been in the past. In his opinion, the electrical undertaking of the Corporation would be carried on on business lines. The Corporation were paying the Gas Company over £2000 a year for street lighting, under a contract renewable every three years. The present contract expired in October or November next. When they had the electric light in their own hands, he thought they would be in a better position to negotiate fair terms with the Gas Company. In his opinion, the price charged for gas was too high. This applied both to street lighting and to the individual consumer. The prices were higher than in the neighbouring towns.

By Mr. HONORATUS LLOYD: In his view, the purchase of the undertaking would not involve any charge on the rates. This, of course, depended on the period over which the loan extended. He did not think 20 years would be a satisfactory period. If it was 25 years, there certainly would be no charge on the rates. He thought the Electricity Company's prices were too high. He did not think large consumers were getting sufficient rebate. He did not know whether, if the Corporation carried on the undertaking, they would charge less. If they studied the interests of the ratepayers as consumers, undoubtedly they ought to charge less. He had based all his calculations on the profits made by the Company at the present prices. He did not think the Corporation had led the people to suppose they were going to reduce the cost of the light. Undoubtedly, electric light plant depreciated; but not very quickly. The Company's plant had been in use a little over thirteen years. He admitted that the Corporation were going to pay the full capital expenditure, as though the plant were new.

Mr. HONORATUS LLOYD: You know that corporations carrying on electric light undertakings can charge what they like for street lighting, and put up the price so as to make it appear that the undertaking is a paying concern; and that it was to stop this practice that the Northumberland clause was inserted in certain Bills?

Witness: Yes.

Have you any objection to the clause?—I don't offer any opinion.

You say you want fair and wholesome competition. You would have this if the clause was inserted?—I am afraid I don't know enough about it.

By Mr. KEEN: He thought the Corporation might be allowed to use their discretion and charge what they considered a fair and reasonable price from time to time. He did not anticipate that there would be a deficiency in the rates by reason of this undertaking.

Mr. *Thomas Holt*, the Town Clerk of Winchester, gave formal evidence of compliance with the requirements of the Borough Fund Act. The Borough rate at Winchester was 2s. 10d., and the general district rate 3s. 9d.; making a total of 6s. 7d. in the pound. If the Bill passed, it was the intention of the Council to carry on the undertaking on proper commercial lines. They would endeavour to supply electricity at as cheap a rate as possible compatible with the commercial success of the undertaking. There was no desire to injure the Gas Company or to do anything outside the limits of fair competition. There was room for both gas and electricity. Both undertakings had been doing very well in the past; and he did not see why they should not continue to work side by side.

By Mr. HONORATUS LLOYD: The Electric Light Company were carrying on their business on a commercial basis; and the Corporation had no objection to doing the same thing. He objected to giving the Northumberland clause. He admitted that one of the objects the Corporation had in promoting the Bill was to try and get from Parliament a longer period for the repayment of the loan than they could have got from the Local Government Board.

By Mr. BALFOUR BROWNE: The object of the Corporation was to get as long a period as possible for the repayment of the loan, in order to make electricity cheap.

Mr. *F. W. King* said he had been for five years Chairman of the Electricity Committee. He approved of the purchase of the undertaking, and considered the price agreed was a reasonable one. He did not see any likelihood of there being any deficiency in the rates. The property the Corporation proposed to take over was in a very satisfactory condition. In addition to the trading profits, there would be a saving of £400 a year in Directors' fees, and also a saving of office expenses and cost of collection. He anticipated that the undertaking would be progressive. The business had been of a steady, progressive character right throughout. The present price of gas was high; and he thought it very desirable that the Corporation should act as a check upon the Gas Company. He thought it had been proved that there was ample room for the Gas Company to carry on their business satisfactorily side by side with electricity. The Ratepayers' Association had passed a resolution in favour of the Bill. In his opinion, the area of supply asked for by the Corporation was not too large—indeed, he thought it should be extended.

In cross-examination by Mr. PADDON, witness said £90,000 practically represented the capital expenditure of the Company. He did not think it extraordinary that a Company in selling an undertaking of this kind after 13 years should receive back the whole of their capital expenditure. A large sum had been expended on the maintenance of the plant and machinery. He thought the price the Corporation had agreed to pay was fair, considering everything. He believed it would be possible to light Winchester at a less cost than £2 19s. 6d. per lamp per annum. With regard to the Northumberland clause, he did not think they ought to be hampered by having to fix a price for three years.

Mr. PADDON: The Gas Company are hampered by being obliged to make a profit. If you make a loss, you fall back upon the rates. Do you know any £20 houses in Winchester which are now taking electricity?

Witness: A good many are coming in now, through the free-wiring system.

Mr. *Charles Spark*, Engineer-in-Chief to the County of London Electric Supply Company, stated that he found the works well maintained and sufficient to meet present and future demands. At £91,000, the purchase would be a good bargain for the Corporation.

Mr. *F. E. Gripper*, another electrical expert, also gave evidence in support of the Bill.

Mr. *W. B. Keen* gave financial evidence in relation to the undertaking, and expressed the opinion that forty years was not an unreasonable period for the repayment of the loan.

This closed the case for the promoters.

Mr. PADDON, on behalf of the petitioners, then called

Mr. *J. C. Warner*, the Chairman of the Winchester Gas Company, who stated that in the outlying area which the Corporation proposed to supply the houses for the greater part were small dwellings of less than £20 annual value. Many of them were merely agricultural cottages; and he thought it most unlikely that they would take a supply of electric light. He did not believe the people of Winchester had been properly informed of the terms on which the Corporation proposed to acquire the undertaking. The report was presented to the Council on Jan. 5, and was published in the papers the following Saturday. A general election was proceeding at the time; and within fourteen days the bargain was struck. So the ordinary ratepayers had no opportunity of forming an opinion until it was too late; and then they felt it was no use protesting against an accomplished fact. The bargain was struck when the notice was served on the Company. So far as he knew, not a single local authority in the proposed outside area had made application to the Corporation for a supply of electricity. The Gas Company had been engaged in perfectly fair competition with the Electric Light Company for the past twelve years. Both had tendered for the supply of light; and he presumed the Gas Company's tenders were the lower, because the Corporation accepted them. He objected to any form of competition which had the rates behind it. He did not consider that the Corporation had made a good bargain in paying the Company their full capital expenditure without any allowance for depreciation. He understood the Local Government Board took the same view; and he thought before this purchase was sanctioned there should be a Local Government Board inquiry.

By Mr. BALFOUR BROWNE: He was present at the ratepayers' meeting; but he could not say he took an active part in it. He certainly voted against the Bill. The capital of the Gas Company, in 1909, was £176,000. They were paying 8 per cent.

Mr. BALFOUR BROWNE: You say you want to compete on fair terms. Don't you know that a corporation have to provide a sinking fund, while a gas company has not. Is that fair terms?

Witness: A gas company is compelled to keep up its plant.

So are we; and we are bound to provide a sinking fund as well. Surely, under the circumstances, it is only fair that we should have a long period in which to repay?—There are other considerations.

The only other consideration is competition. Don't you think competition is a good thing for consumers of gas and electricity?—Yes.

By Mr. PADDON: Corporations had to provide a sinking fund; but they did not have to pay dividends.

Mr. *J. F. Snell* said he had had 22 years' experience of the generation and supply of electricity. He had studied the accounts of the Winchester Electric Light Company with a view to ascertaining the condition of the plant. He should say, on the whole, it was modern; but he was not allowed to make an actual inspection. When application was made, permission was refused. From an inspection of the books, he came to the conclusion that practically the whole of the plant was at least seven years old, and some of it thirteen years old. He considered the price proposed to be paid by the Corporation was excessive.

Monday, March 27.

Mr. PADDON, addressing the Committee on behalf of the Winchester Gas Company, said they did not oppose the Bill because they objected to competition. Whether the Bill was passed or not, the Gas Company would still be subject to competition. Their objection to the Bill was that it asked Parliament to sanction an essentially bad bargain on the part of the Local Authority, and that the price proposed to be paid for the undertaking was excessive. The Corporation proposed to pay to the Company every farthing of capital expended since their formation 13 years ago, *plus* 10 per cent. Considering that one-third of the plant connected with the undertaking was thirteen years old, and that the greater portion of it was at least seven years old, he contended it was absurd to suggest that the plant could possibly be worth all the money that was paid for it. It would be contrary to parliamentary practice to sanction a bargain of this kind. He was perfectly willing to assume that everything that was necessary had been done in the way of renewal and repairs; but nevertheless the plant must have seriously depreciated in value and have become obsolete. If the Corporation proposed to give the full cost price for it, it was obviously a bad bargain from the buyers' point of view. The Corporation knew that if they went to the Local Government Board they would not get more than twenty years for their loan; and their sole object in coming to Parliament was to get a longer period. The inherent defect of the Bill was found in the deed of transfer agreed to between the Corporation and the Electric Light Company, which was drawn up before the eminent experts who had been called—Mr. Sparks and Mr. Mertz—had been consulted. When they were called in, the terms of purchase had been settled. Their hands were tied; and they had to make the best of the bargain. He strongly opposed the proposals in the financial clause. It was the settled practice of Parliament that, when new capital was asked for, details should be furnished as to how the capital was to be expended. The Corporation were asking for leave to borrow £20,000; and they were bound to satisfy Parliament that the object for which the money was required was a reasonable one. He asked the Committee not to pass the preamble of the Bill unless the promoters agreed to the insertion of the Northumberland clause. This could do the Corporation no possible harm if they were making a profit. It only came into operation if they were working at a loss. With regard to the report of the Local Government Board, he contended that it strongly supported every contention he had raised. It pointed out that the assessable value of the property in Winchester was only about £123,000, that at the last census the population was 20,929, and that the sum proposed to be paid for the undertaking was £91,000, which was nearly three-fourths of the assessable value of the borough. It was proposed, the Board pointed out, in clause 24 of the Bill, that the Corporation should be authorized to borrow an additional sum of £20,000 for extension of works and working capital. The question whether the Corporation should be authorized to acquire the undertaking on the terms proposed was one which, in the opinion of the Local Government Board, ought to receive the careful consideration of the Committee. The Board were of opinion that ten years should be the limit of the loan for the purchase of fittings and working capital. In conclusion, the learned Counsel said there could be no doubt that sooner or later the Corporation would find themselves saddled with a bad bargain. The object of the Gas Company was to compel them to trade on a fair basis, and to prevent them selling electricity under its true price. They did not object to sound, healthy commercial competition. But under the terms proposed in the Bill, the competition would not be sound and healthy, because it would be rate-aided. He asked their Lordships to reduce the period of the loan in accordance with the recommendation of the Local Government Board.

Mr. TYLDESLEY JONES, who appeared (against alterations) for the Winchester Electric Light and Power Company, said the Corporation had given the Company notice of their intention to purchase under the terms of the deed of transfer, and had agreed to pay £91,000. If their Lordships rejected the Bill, it would simply mean that the Company would go to arbitration, when they would claim not less than £99,000, which they believed they would be able to compel the Corporation to pay.

Mr. BALFOUR BROWNE, replying on behalf of the promoters, asked their Lordships to consider what would happen if the Bill were rejected. There was no question now as to purchase. The Corporation had given notice; and if the Bill were rejected, the Company would force them to go to arbitration to determine the amount of capital reasonably expended on the undertaking. If they went before the arbitrator to-morrow, the Corporation would be bound to give £90,000, *plus* 10 per cent.; so that, by rejecting the Bill, the Committee would be putting upon the ratepayers of Winchester an additional burden of £9000. The Gas Company's sole object was to make electricity as dear as possible. On the other hand, the desire of the Corporation was to make electricity as cheap as they could. The object of the Gas

Company was to prevent competition. The Corporation wished to promote healthy competition. With regard to the report of the Local Government Board, he would remind them that the Board were not the authority dealing with electricity. The real authority were the Board of Trade. They gave the Corporation their Order in 1895; and they approved of the terms of the transfer under which the Corporation were empowered to buy back the undertaking on payment of the capital reasonably expended, *plus* 10 per cent. If it were a bad bargain, it was sanctioned by the Board of Trade; and the Corporation could not get out of it. He held that it was a good bargain. There was ample evidence that the undertaking would pay in the hands of the Corporation. He was prepared to make a concession with regard to the loan. He asked the Committee to give them forty years for the repayment of the loan for the purchase, and thirty years for the repayment of the loan for extensions and improvements. He hoped they would not hamper him by insisting on the insertion of the Northumberland clause. He asked their Lordships not to attach too much importance to the report of the Local Government Board.

The room was then cleared. On the return of the parties,

The CHAIRMAN said: The Committee pass the preamble of the Bill, subject to the amendment that the capital for the purchase shall be repaid in forty years, and the new capital in twenty years. The Northumberland clause is to be inserted.

The clauses having been amended to meet these requirements, the Bill, as amended, was ordered to be reported.

SIDMOUTH GAS AND ELECTRICITY BILL.

HOUSE OF LORDS COMMITTEE.—March 27.

[*Before the Earl of* CAMPERDOWN, *Chairman, Marquis* CAMDEN, *Earl of* HARDWICKE, *Viscount* BARRINGTON, *and Earl of* VERULAM.]

By this Bill power is sought to incorporate and confer further powers on the Sidmouth Gas and Electricity Company.

Mr. G. M. FREEMAN, K.C., and Mr. JEEVES appeared for the promoters. The only petitioners in opposition were the Urban District Council of Sidmouth, represented by Mr. WEDDERBURN, K.C., and Mr. KEEN.

Mr. FREEMAN, in opening, said the Sidmouth Gas and Electricity Company was incorporated under the Companies Acts, in 1886, to supply gas in the three parishes of Sidmouth, Salcombe Regis, and Sidbury, and to adopt an agreement which had been made with a Mr. Douglas, under which he was to sell the gas undertaking which had been established by a Mr. Dunning under a Provisional Order; the amount of the purchase price being £8030. Mr. Douglas, as part of the arrangement, was to be appointed Managing-Director for life; and so long as he occupied this position, he guaranteed a dividend of 5 per cent. on £3000 of preference stock. The capital of the Company was £15,000 in shares, and £5000 in debentures, all of which had been raised. Since the Company acquired the property, they had almost transformed it. The works had been modernized and reconstructed. Two new gasholders had been constructed, increasing the storage capacity from 16,000 cubic feet to 102,000 cubic feet. The mains had been almost entirely renewed, and in many cases enlarged. The retorts had been largely increased, and some of modern type erected. So also with the purifiers. Buildings and plant for the manufacture of sulphate of ammonia had been provided. The income had risen from £1500 in 1889 to nearly £4000 in 1910. Last year practically 22 million cubic feet of gas were made, and 18½ millions sold. The Company were entitled to charge 8s. 4d. per 1000 cubic feet. When they purchased the works, the price charged for gas was 7s. per 1000 cubic feet; but this figure had been gradually reduced, until the price for lighting purposes was 4s. 7d., less a discount of 5d. For gas used for cooking and power, it was 3s. 9d.; and for public lighting, 3s. 11d. Long before the Company paid full dividends they reduced the price. For several years full dividends had been paid—7½ per cent. on the "A" preference, 4½ per cent. on the "B" preference, and 10 per cent. on the ordinary capital. In 1903, the Urban District Council obtained an Order entitling them to supply the electric light. The Council tried to start the supply of electricity; but after various efforts the whole thing came to an end, and the Order was revoked. Sidmouth had developed considerably; and it was generally felt that if a supply of electricity could be afforded economically, it would be used to a considerable extent. One of the main objects of the Bill therefore was to obtain powers to construct works for the production of electricity and to supply current. Authority was also sought to increase the capital, partly for the electricity works and partly for the ordinary expansion of the gas-works, to create certain reserve funds, &c. At present the Company were very well situated for dealing with electricity. They had unoccupied ground immediately adjoining the gas-works on which they might erect a generating station, &c. There were abundant precedents for a gas company obtaining an Electric Order. The present Bill was drawn mainly on the lines of the Farnham Bill of last year, and it was finally decided that this measure was the best form such a Bill could take. In the petition two important matters were raised. It was said to be undesirable that a gas company should apply to Parliament for powers with regard to electricity, and that they should apply to the Board of Trade for a Gas Order and for an Electric Order. The answer of the Farnham case would, he hoped, fully satisfy. The Sidmouth Council in their petition stated: "The undertaking was sold in or about the year 1886 by the successor of John Dunning to Thomas Douglas for the sum of £6000, and it was transferred to the Company for the sum of £8030; the profit of £2030 not being represented by any asset in the undertaking." This was wrong, because nearly £10,000 had been spent in the works. Mr. Douglas bought the concern at auction for £6000; and the result of its sale, by him, to the Company for £8030 was that the Company practically saved £2000. The Council were quite wrong in saying Parliament never allowed capital to be dealt with as the promoters proposed to deal with it. There were a number of cases in which it had been allowed. The petitioners considered that the dividend proposed to be paid on the additional share capital was higher than was consistent with a cheap supply of gas. They also regarded the works as being a great eyesore and nuisance, and suggested that they should be abandoned, and removed to a position where they would not be a nuisance. The gas-works, as a matter of fact, could not be seen from the esplanade; and, being well managed, no smell came from them. The petitioners asked for a purchase clause to be inserted, and that no enhanced value should be put upon the undertaking by reason of the Company having obtained statutory powers. But such a thing was absolutely unparalleled, except in about two cases, where the grossest mismanagement had been proved. Objection was taken to the provision in clause 46—that Mr. Thomas Douglas should continue in office. Then the Council complained of the standard price. By a slip, this was given in the Bill as 4s. 10d. The discount of 5d. had been forgotten. Therefore the 4s. 10d. should be 4s. 5d. They also objected to the electricity clauses; urging that the operations of the Company were much too small to permit them to carry the burden of an electricity installation without it proving a heavy financial strain on the gas undertaking, and thus preventing reductions in the price of gas. Moreover, the Company would have a monopoly in the supply of artificial lighting. In any event, they regarded the proposed site for the generating station as most unsuitable, and would accentuate the nuisance of the gas-works. They believed the Company had no intention of generating and supplying electricity—that there would be no obligation on them to do so, and that the powers were sought merely to prevent competition with their gas undertaking. The Council also objected to a number of other matters relating to the clauses dealing with electricity. But counsel asserted that these were settled by the general law.

Mr. *Thomas Douglas*, in reply to Mr. JEEVES, said he was a gas engineer. At present he did not practise, except in connection with the promotion of companies. He was associated with a number of gas undertakings, and Managing-Director of the Sidmouth Gas Company. In 1896, he purchased for £6000 the statutory gas undertaking authorized by the Sidmouth Gas Order of 1874. The returns to the Board of Trade showed that at that time Mr. Dunning had spent £9710 on it. The undertakers were entitled to earn a dividend at the rate of 10 per cent. on the capital expended, which equalled £971. He sold the undertaking to the Company for £6030 cash and £2000 in shares, limiting the dividends payable in respect of the £8030 to £648. Of the sum, £2000 was raised at 6 per cent., £3000 at 7½ per cent., and only £3030 at 10 per cent.—the maximum dividend he was entitled to claim under the statutory powers. Thus the Company started with the right to receive some £270 less per annum than the consumers could have been compelled to pay under the statutory powers. He reduced the dividend as rapidly as possible, and went so far in carrying out this policy that for some 16 years he paid only 5 per cent. on the 7½ per cent. capital; while for two years he paid no dividend at all on the 10 per cent. capital, and for a number of years 5 per cent. and sometimes only 2½ per cent. Thus he gave the consumers the benefit of sums amounting to £5051. Only from 1903 had full dividends been paid. In floating the Company, he guaranteed the dividend on the preference stock up to 5 per cent., and undertook to pay all liabilities incurred between the time of purchase and the flotation of the Company, including the expenses of flotation. The contract with the Company provided that he should be Managing-Director; and that as long as he occupied the position he should be entitled to live in the house which had been built for him. He did not live at Sidmouth; but he went there frequently, and when there he lived at this house. There was a Manager who resided in another house belonging to the Company, which was next door to that occupied by him. The population of Sidmouth was now estimated at about 5000. From time to time after the Company entered into possession of the works, enlargements and improvements were provided. Some cottages and a considerable area of ground adjoining the works had been purchased. The total capital now raised amounted to £20,000, in respect of which the dividends payable were £1525; and for these dividends statutory authority was asked in the Bill. Though the sum of £20,000 had been spent, he was only asking for dividends equal to the amount to which he was entitled in respect of the £15,000 originally authorized under the Statute.

Mr. WEDDERBURN, in reply to the Chairman, said the Council were asking for the insertion of a purchase clause. The Company were *quasi*-statutory at present.

The CHAIRMAN: They are statutory. Surely you are not going to argue that the Order of 1874 does not exist.

Mr. WEDDERBURN: At present they are a combination of a statutory Company with an Order, and a limited Company.

The CHAIRMAN: No; no. They are working under their statutory Order of 1874.

Mr. WEDDERBURN: Not quite. They are at the present moment a limited Company working under statutory powers. They are asking to be a purely statutory Company.

Mr. FREEMAN: No they are not.

The CHAIRMAN: That seems to me as nearly as possible, if not quite, the same thing.

Mr. JEEVES: We ask your Lordships to say it is the same thing, because there is no doubt about it.

Witness, in further examination, said there was no reason to suggest that the situation of the works should be changed. He thought it desirable that an electrical undertaking should be established. There were a very large number of private installations; and these were increasing. The Local Authority were giving permission for wires to be laid in the roadway by private people for the purpose of supplying different premises. It was very unsatisfactory for the Company to have their mains and pipes injured by electricity. They had no power apparently to control them. They gave them no notice. They opened the roads apparently with the permission of the Local Authority. In 1903, he offered, on behalf of the Gas Company, to apply for the necessary powers to enable them to establish an electrical undertaking. The Local Authority refused to sanction the application, and shortly afterwards entered into an agreement in pursuance of which they applied for a Provisional Order, which was to be taken up by Messrs. Crompton and Co. The Order was obtained, but nothing was done; and it was revoked in 1908. There was no foundation for the suggestion that there was no intention to carry out the powers sought with regard to

electricity. No complaints had arisen regarding the manner in which the works were conducted. The standard price asked was that being charged to ordinary consumers, *plus* 3d. to allow for any fluctuation in the price of coal, &c.

Cross-examined by Mr. WEDDERBURN: It was not true that people, when they made complaints, were told that they must wait until witness went down to Sidmouth. When witness bought the works, he paid nothing for goodwill. He had about 340 £10 shares, and his daughter about fifty. It was proposed that he should by Statute be made Managing-Director for life. He could not give a precedent for the proposal. The salary was fixed by the Directors; but they could not put it below £50. His present salary was £75, which only paid his expenses.

In further cross-examination, witness said that just previous to the present application to Parliament the Company raised the balance of their authorized capital, £1700, in order to provide for extensions. He did not admit that the exhauster, purifier, and gasholder were largely in excess of the present demand. He had not heard any complaints with regard to the quality of the gas. There had been one or two complaints of smell. New mains had been laid at a depth of 2 ft. 6 in.; but pipes laid 20 or 30 years ago were not so deep down. There was a considerable amount of unaccounted-for gas. This was caused by the steam-roller breaking the mains.

Mr. *W. H. Hastings*, Estate Agent to Colonel Balfour, the owner of the Sidmouth Manor Estate, and Secretary of the Gas Company, said that if the Gas Company supplied electricity, and provided the supply were not delayed too long, there would be a fair market for it.

Cross-examined: About ten years ago, when there were smells at the gas-works, the Company thought it would be a good thing to shift them. Mr. Douglas was willing to remove the works if the cost were defrayed. Witness approached Colonel Balfour (who said he would contribute £500) and other people; but he could not get another £100. Colonel Balfour thereupon immediately let his building sites near the Railway Station, and would, he thought, now sternly oppose the removal of the works to that locality.

Mr. *J. J. Skinner*, a builder and contractor, of Sidmouth, said he had erected a large number of houses, many of the occupants of which would be glad to use electricity. There was an urgent need for a supply of current.

In cross-examination, witness said that when the Council obtained the Electric Lighting Order in 1903 they put it in the hands of a Mr. Crompton, who, in return for the sole right to supply electricity, paid the Council £50 per annum. He paid the money for three or four years, but did not supply, and the Order lapsed. Since then the demand for electricity had largely increased.

Mr. *F. J. Potbury*, an auctioneer and house agent, said the lack of electricity retarded the development of the district. Some houses had been wired.

Tuesday, March 28.

On the resumption of the proceedings to-day,

Mr. *R. W. Sampson*, an architect and surveyor, gave evidence in support of the anticipated demand for electricity. There was a public need and a public demand for electricity; and there was no likelihood of a supply being given unless the Gas Company undertook it. He had had no cause to complain of the Gas Company, and had experienced no nuisance in connection with the gas-works. Even supposing the gas-works were removed, the site was not suitable for the erection of better-class property. He had never heard of any real desire among the ratepayers that the Council should possess the works.

Mr. *Corbet Woodall*, examined by Mr. JEEVES, said the works represented reasonable value for the £18,300 expended on them at the time of making-up the last accounts. In the past six years, the increase in the consumption had been at the rate of 5·3 per cent. compound. This was a very good rate. In the next ten years, the capital which, according to his estimate, would be required was £8178. This, under the circumstances, was a small sum. The rate of increase of 5·3 per cent. would give in ten years 12½ million cubic feet, for which he allowed capital expenditure at the rate of £750 per million. In his opinion, 4s. 2d. was a fair standard price. At present, the Company allowed an extravagant discount, and were put to no expense for collection. Taking 4s. as a fair price, and allowing 2d. for collection, he arrived at the figure of 4s. 2d. The undertaking was reasonably and properly managed. There were points in which the works could be improved; and they were in process of being improved. The site was quite suitable. There was not sufficient reason for the removal of the works, and for the expenditure which removal involved. With a little care, the works might be made no eye-sore. In a small place like Sidmouth, it was emphatically desirable that electrical powers should be held by the Gas Company; so that two agencies for light should be controlled by one authority. The two undertakings could be well and economically managed by one company for the benefit of the consumers, whether they used gas or electricity.

In cross-examination by Mr. WEDDERBURN, witness said he had always been against the transfers of undertakings from companies to councils. He knew of no case, except one, in which a transfer had been made against the will of the company, and that was an instance in which a substantive Bill was brought in in the same session. He agreed that if a purchase clause was to be asked for, now was the time to ask for it. The capital sought would be spent on additional works and mains, and very largely on additional meters and stoves. Some of the works were in excess, but not all. Dividends ought to be paid on the £2030. He did not know of an exact precedent. How ever the present capital of the Company was made up, it was not high.

Mr. *John Houblon*, central station designer to Messrs. Crompton and Co., Electrical Engineers, examined by Mr. JEEVES, handed in an estimate, according to which £7247 was required for an electric installation in connection with the gas-works at Sidmouth. For main extensions and house installations in the next ten years £4000 would be needed. The electricity was to be produced by gas-engines in conjunction with the gas undertaking. He considered the electric installation would go very well with the gas concern.

By the CHAIRMAN: If powers were given to the Company for the supply of electricity, he had not the slightest doubt that the existing private installations would be abandoned, though not in the first year or two.

This closed the case for the Bill, and evidence in support of the petition was then called.

Mr. *Thomas Were*, the Chairman of the Urban District Council of Sidmouth, said the Council as a body desired that an opportunity should be given to the town to purchase the gas-works. At present there had not been a referendum on the matter. When the question had come before the Council the feeling had usually been nearly unanimous—Mr. Skinner being the only dissentient. The present position of the gas-works destroyed the amenity of the front view of the sea. The school near the works was annoyed by the smell from them. Last week, he found a main only 9 inches below the surface of the road. The Council held that it would be undesirable to have the gas and electricity supply in the same hands.

In cross-examination, witness said he did not think there would be any disadvantage in the establishment of an electricity supply in Sidmouth. Probably all mains laid in recent years were at a proper depth. Under the Gas-Works Clauses Act, all mains had to be laid to the satisfaction of the Council. He was not aware that, as reported in a local newspaper, he stated last year that the Council would not entertain the idea of purchasing the Gas Company's works. As a ratepayer, he would vote for the Council buying the gas undertaking on the usual arbitration terms. He wanted to have the works removed.

Mr. *Albert Maeer*, the Chairman of the Lighting Committee of the Sidmouth Urban District Council, said he had made many written complaints to the Company about the public lighting. The time of lighting and extinguishing, and the general up-keep of the public lamps, had been open to great objection. The roads had been broken up and replaced in an unsatisfactory way. He had received complaints as to the price and quality of the gas. In consequence of the high price and poor quality, some shops were still lighted by oil.

In cross-examination, witness said he had brought the complaints regarding the quality of the gas before the Council; but he could not say the Clerk had ever been instructed to complain to the Company.

Mr. *S. G. Budd*, a member of the Urban District Council gave corroborative evidence.

Mr. *J. G. Halse*, another member of the Council, said the illuminating power and pressure of the gas varied, and was very often unsatisfactory. The gas-works were very undesirable in their present position. Their removal would tend to develop and improve the town. The price of gas was high.

Mr. *R. Lake*, Surveyor to the Council, said he had received frequent complaints with regard to the public lighting. The position of the works was detrimental to the town. On many occasions visitors had commented on their position, and on the smell from them.

Mr. *E. G. Trump* said he had constantly had cause to complain of the poor light given by the gas. Bad smells came from the gas-works; and on a good many occasions he had had to get up in the night and shut his window in consequence.

Mr. *E. H. Stevenson*, examined by Mr. WEDDERBURN, said he agreed that there were many Acts in which purchase and suspensory clauses, either or both, appeared. If a clause was to be asked for in this case, now was the proper and only time. Of recent years, in the case of gas undertakings, it had been more common for a purchase or suspensory clause to be granted than to have a competing Bill. There was no precedent for the proposal, against the opposition of the local authority, to give a gas company electrical powers. The works of the Company were in excess of present requirements. The maximum make was about 90,000 cubic feet a day. The retorts were 70 per cent. in excess of this make; the exhauster, 33⅓ per cent.; the purifiers, 39 per cent.; and the gasholders, 13⅓ per cent. There were only two purifiers, and it would be convenient to have three. There was no doubt the existing works were a nuisance and an eyesore. It would be an immense advantage if they were removed to the north of the Railway Station. There were no houses near where he would put the works. For gas purposes, the Company required very little capital. The expansion in consumption was, on the average, under 3 per cent. in the last three years. The Company were more favourably situated than almost any company he knew, because the load was spread over a longer period. Most companies in England had a maximum winter's make which, divided into the annual make, gave 200 or under as the dividend. Here the corresponding figure was 244; so that the works required were less than usual. An additional £3000 of share capital would carry the Company on for the next 12 or 15 years. They needed practically nothing at all except a condenser and a washer to assist the scrubber, and a duplicate exhauster. An extra purifier would be an advantage. These things would not cost more than £600 or £700. He would allow £300 per million cubic feet for the extra quantity of gas which the Company would sell in the period indicated—namely, 10 million cubic feet, which would give £3000. Thus the Company would require £3700. They had recently raised £1700, which reduced the figure to £2000. Beyond this, however, he would allow a further £1000. The Company would have to pay for the present Bill. The capital to-day was fairly high. It amounted to £1000 per million cubic feet of gas sold. This was largely accounted for by the works being so much in excess of what was necessary at present. As the make of gas increased, this figure would decrease. In the last seven years the rate of increase was 6 per cent., the actual figures being 13⅓, 9½, 9, 5, 1¼, 1½, and 5½ per cent. As to the £2000, the difference between the price at which Mr. Douglas bought the works and sold them to the Company, Parliament had never allowed such money to be dividend bearing. The Company were charging a higher price than they ought to do. Paying maximum dividends, the Company could, in 1910, have sold gas at 3s. 8d. per 1000 cubic feet as the highest price. If the £2000 were eliminated, the 3s. 8d. would become 3s. 5d. The proposed standard price of 4s. 2d. should be reduced. He suggested that it should be 3s. 8d. Even at this rate, the Company could easily pay more than the standard rates of dividend.

By the CHAIRMAN: The Company were now making a profit which largely exceeded the amount required to pay standard dividends.

In cross-examination by Mr. FREEMAN, witness said the Company had behaved very badly ever since they were incorporated, by paying dividends on the £2000, which had been taken as profit. Parliament

had always looked askance at such capital. With a statutory company, it was not usual to ask for a purchase clause, except in case of bad behaviour. He thought the works could be removed to a site adjoining the railway without increasing the cost of gas. It would not be to the advantage of Sidmouth for the Company to sell electricity at a reasonable price and to charge the loss on the gas consumer. He would leave Sidmouth without electricity. People could generate it themselves much more cheaply than it could be sold from a central station like that proposed here.

In reply to the Chairman,

Mr. FREEMAN said that part of the £1700 just issued had been allotted to existing shareholders.

This concluded the evidence.

Mr. WEDDERBURN then addressed the Committee in support of the petition of the Council. In regard to the proposed purchase clause, he said the Company were applying to be made statutory, and now, therefore, was the time for the Council to claim their rights and to be given the option to purchase. The Company were also asking to be made statutory suppliers of electricity. Although the Company were statutory as regarded share capital, dividends, and price of gas, they were non-statutory as regarded their loans, all of which had been borrowed, not by statutory order, but in their capacity of a limited liability Company. No blame attached to the Council because they obtained an Electricity Order which was afterwards revoked. Was one person to have a monopoly in the supply of electricity? He asked for a clause providing that for a year the Company should not establish an electricity supply, and should not extend their gas-works—thus giving the Council an opportunity to consider whether or not they would purchase. If the Committee inserted a purchase clause, when the Council came for a Bill next year no doubt they would ask not only for power to purchase, but to remove the works. If given the usual purchase and suspensory clause, so that the Council might consider the question of removal, he did not desire to prevent the Bill proceeding, except as regarded some matters of clause. If not given the purchase and suspensory clauses, the Bill would be so fatal to the interests of Sidmouth that the Council desired it should not proceed.

Mr. FREEMAN said the suspensory clause and the purchase clause were very different; and while he would here resist both, he would resist the latter as strongly as he could. There might have been one case, or possibly two cases, in which no very strong complaint had been proved against a company before a purchase clause was given; yet it was the general rule that bad conduct was the foundation of a purchase clause. The *crux* of the purchase clause was that it settled once for all the principle that the Council were to be authorized to buy, and that the Company were not to be entitled to bring evidence and to argue as if the whole thing was opened afresh; whereas a suspensory clause simply meant that the Committee, without giving an opinion on the question of purchase, said that the Company should not put themselves in a better position in the next twelve months by taking advantage of the Bill. The Council here had taken no steps to test the feeling of the town, or passed a resolution, or done anything to show a *bonâ fide* intention to purchase; and they had not made out a strong case of misfeasance or mismanagement. The Committee therefore should not go out of their way to grant a purchase clause. It would, in the circumstances, be very hard to penalize the Company to this extent. Then although the town wanted electricity, the Council desired to prevent the Company having power to supply it. The Council could have applied for another Order, if they had desired to meet the demand for electricity. But there was no evidence that they had taken, or were willing to take, any step to supply it.

Wednesday, March 29.

When the proceedings were resumed this morning,

The CHAIRMAN said: The Committee have arrived at the conclusion that the Bill may proceed; but when we come to the proper part, we propose to insert a suspensory clause—that is, the ordinary suspensory clause, merely giving the Council the opportunity of putting forward a proposal of their own next year if they see fit. No more than that; no purchase.

The Committee then went through the clauses.

Mr. WEDDERBURN, on clause 18, moved to omit the proviso that Mr. Thomas Douglas, so long as he remained a Director, should continue to act as Managing-Director.

Mr. FREEMAN said the clause had been before the Lord Chairman, who was satisfied with it. The clause was subject to other provisions relating to the incapacity of directors.

The CHAIRMAN pointed out that the clause would make Mr. Douglas a Director for life, not of the existing Company, but of a new Company.

Mr. FREEMAN said that if the clause were disallowed, the Company would have to compensate Mr. Douglas. The arrangement proposed was part of the bargain under which Mr. Douglas sold the undertaking to the Company; and the Company were honourably bound, so far as they could, to carry out their pledge.

After further discussion, consideration of the matter was postponed.

Mr. WEDDERBURN, on clause 20, suggested that the £15,000 of new capital should be split into £5000 for gas and £10,000 for electricity; so that the two capitals should be kept separate.

Mr. FREEMAN objected on the ground that if capital for electricity purposes were raised on the security only of the new electricity scheme, the operation would be more expensive than if the capital were raised on the security of the combined gas and electricity undertaking.

It was eventually agreed that the quantity allowed for gas should be a total of £8000, and for electricity £7000. The period within which to operate the electricity part of the Bill was fixed at three years—a year more than in the Farnham case being allowed in consequence of the insertion of the suspensory clause.

Mr. WEDDERBURN, on clause 24, again raised the point that the £2000, the difference between the price at which Mr. Douglas bought the undertaking and the figure at which he sold it to the Company, ought not to bear interest.

The CHAIRMAN said the Committee were of opinion that they could not interfere.

Mr. WEDDERBURN, on clause 33, said that there was no limit to the amount of interest at which the Company might issue debenture stock. If the Company were able to raise preference capital at 5 per cent., 4 per cent. would be about right for debenture stock.

Mr. FREEMAN submitted that in the public interest the limitation should not be inserted. If it were inserted, the Company might not be able to issue debentures at 4 per cent., in which case they would not be able to issue debentures at all. If the Committee thought a limit should be inserted, he would accept 5 per cent.

The CHAIRMAN, after further argument, said they would leave the clause.

Mr. WEDDERBURN asked to delete clause 39—"The prescribed scale of voting shall be one vote for every ordinary share and one vote for every two preference shares"—and that the scale of voting should be that provided by the Companies Clauses Act. Mr. Douglas had 340 shares, and his daughter about 60. These, under the clause, would be 400 votes straight away.

Mr. FREEMAN said the clause was the ordinary one which had been inserted in recent years.

The CHAIRMAN said the Committee would consult with the Lord Chairman; and the clause would therefore be postponed.

Mr. WEDDERBURN, on clause 51, urged that the standard price should be 3s. 11d.—thus splitting the difference between Mr. Woodall's price of 4s. 2d. and the petitioners' figure of 3s. 8d.

The figure of 4s. was eventually agreed upon; and the clause was amended accordingly.

On clauses 68 to 73,

Mr. WEDDERBURN said that these provisions related to the proposed supply of electricity. All these clauses should be struck out, and no electrical powers given to the Company. On the evidence, there was no precedent for giving such powers to a company in the absence of the consent of the local authority.

Mr. FREEMAN asserted that in the most recent case—Bishop's Stortford, of last year—such powers were granted without the consent of the Local Authority having been obtained.

Mr. WEDDERBURN, in reply to the Chairman, said that if the Council purchased the undertaking next year, they would have to buy it as it stood; but if his present contention were granted, the undertaking would not include electricity powers.

The CHAIRMAN said the Council did not come with quite clean hands, because they formerly had an Electricity Order and took no effective steps with it.

The Committee decided the electricity clauses were to stand.

Thursday, March 30.

Further consideration was given to clauses to-day.

Clause 18 was altered so that Mr. Thomas Douglas was included in the general provision with regard to officers and servants of the Company holding office until they resigned or were removed by the Company—the special proviso to which Mr. Wedderburn had taken exception being struck out.

On clause 39, relating to voting,

The CHAIRMAN said: This is contrary to the usual law. I propose to move that the clause be made part of the Bill, but on the understanding that it is referred to the Lord Chairman, who will consider whether it is desirable to sanction this departure from the ordinary law.

The clause was then agreed to.

A new clause was adopted under which, if Mr. Thomas Douglas ceased to hold the office of Director or Managing-Director otherwise than by reason of his having become disqualified or having died or resigned, the Company should pay to him compensation in respect of the loss of such office or offices on the basis of the salary and of the terms and conditions on which he held office or offices under the limited Company on Jan. 1, 1911—the amount, failing agreement, to be fixed by arbitration.

The suspensory clause in the form adopted in the Heckmondwike and Liversedge cases was then added.

The other clauses having been adjusted, the Bill, as amended, was ordered to be reported.

METROPOLITAN WATER BOARD (NEW WORKS) BILL.

(*Before the Earl of* KINTORE, *Chairman*, *Lord* SEATON, *Lord* GOUGH, *Lord* MARCHAMLEY, *Mr.* J. A. DAWES, *Mr.* J. H. DUNCAN, *Mr.* H. INGLEBY, *and Mr.* B. STANIER.)

The Joint Committee of the two Houses of Parliament appointed to consider the Bill promoted by the Metropolitan Water Board for the construction of new works and reservoirs on the banks of the Thames near Staines, and also the Bill promoted by the Conservators of the Thames to amend and consolidate the enactments relating to the abstraction of water from the river by the Board, and the payments made by them to the Conservators, met in the Grand Committee Room, Westminster Hall, last Wednesday, and determined their course of proceeding.

Counsel for the promoters of the Water Board's Bill are Mr. BALFOUR BROWNE, K.C., Hon. J. D. FITZGERALD, K.C., Mr. COURTHOPE MUNROE, and Mr. W. D. HARBINSON. As already recorded in the "JOURNAL," there are a large number of petitioners against the Bill; and the majority of them are represented by Counsel.

The first matter to engage the attention of the Committee was an application by

Mr. VESEY KNOX, K.C., on behalf of the Conservators of the Thames, who asked that their Bill might be taken before Easter. He pointed that though this Bill and that of the Water Board were put together they were not closely connected. The Conservators' Bill was a small measure, and there was reason to hope that the opposition to it of the Port of London Authority would be met as the result of negotiation. He said the Committee could determine the Bill without considering the other, and not reporting it to the House till the other had been dealt with.

Mr. BALFOUR BROWNE said he should like the Committee not to decide the matter till after Easter, by which time, he thought, a great many of the petitions against his Bill would be disposed of by negotiation. The two Bills were connected; and if the Committee passed the preamble in each case, the clauses of both might, he thought, be considered at the same time.

The CHAIRMAN said the Committee were of opinion that it was usual in such cases to hear the "heavy" Bill first. Accordingly, they would begin consideration of the Water Board's Bill next day.

The Case for the Promoters.

The inquiry opened on Thursday morning, when

Mr. BALFOUR BROWNE read from reports of the Royal Commissions presided over by Lord Balfour of Burleigh in 1893 and Lord Llandaff in 1898, and said the scheme of the Bill followed these reports. The increase of the water supply in the London area had been from 143,821,000 gallons in 1881 to 224,174,000 gallons in 1898-9. Of this supply, 128,383,000 gallons were derived from the Thames and the remainder from the River Lea and wells. For the future supply, the Board had followed the estimate of Lord Llandaff's Commission of a population of 12 millions, with an average consumption per head of 35 gallons per day, making a total of 428 million gallons. The only source capable of expansion was the Thames; and the supply could only be increased by storage. The existing works would serve until 1917. Proceeding to give details of the scheme embodied in the Bill, Counsel said eight reservoirs were originally proposed, but one near Sunbury had been given up. In the plans for reservoirs Nos. 1 and 2, modifications had been made, and they would be set back so as to be not less than 600 feet from the river. The first instalment would take about five years to construct; and this would carry the Board on to 1923. The estimated cost of the works was £6,500,000. It had been shown that the water would be of excellent quality, and that treatment of it by storage would provide absolute protection against typhoid. The Board's income was 7s. 11d. per head of the population; 14 per cent. went in rates and taxes, 6 per cent. in working expenses, and 50 per cent. to interest and sinking fund. There would thus be ample to meet the debt on the rateable value. There would be no injury to land-owning interests that would not be fully met by compensation. In some of the petitions objections had been raised to interference with the picturesque. In answer to these, he might say that the existing Staines reservoirs could be made much more sightly if broken up by trees and shrubs; and the Board were quite prepared to plant the slopes and treat the reservoirs at Hampton and Molesey in the same way. Further, they proposed to do away with their works at Surbiton; and this would improve the amenities of that residential district, and throw open valuable land abutting on the river. Fear had been manifested of increasing the danger from floods. There was no ground for this, as the proposed flood-water channel would carry off far more water than could pass through the gravel. Another point raised was the possibility of pollution of the water from a sewage farm opposite the intake at Datchet. But this farm was shut off from the river by a bank, and there was no effluent into the Thames.

Mr. *W. B. Bryan*, M.Inst.C.E., the Water Board's Chief Engineer, was then called and examined by Mr. J. D. FITZGERALD. He explained the origin of the scheme in the Bill, and gave a description of the new intake channel which it is proposed to construct, and of the pumping-station to be erected in connection with it. The discharge capacity of the channel would not be less than 60 million gallons per day above the pumping-station, *plus* the waters of the Colne brook below it. The water would be taken from the channel into the pumping-station, and be distributed to all the reservoirs in the group. Coming to the reservoirs themselves, witness explained that it was intended to set back Nos. 1 and 2. When a reservoir was finished, and the slopes and embankments were firm, the inside slope would be lined with concrete, and the outside slopes planted with trees and shrubs. Witness explained that the construction of the two reservoirs would necessitate a diversion of the road from Staines; but he maintained that no public inconvenience would be thereby caused. As to the other reservoirs, there was nothing special in regard to them. What was proposed could be done without any difficulty. Witness then put in a table showing the present abstraction of water from the Thames, and citing the Acts and agreements under which the abstraction was authorized. The maximum quantity that might be taken in any one day by the Water Board was 130 million gallons. Witness explained that the Board could take at present from the river a much larger quantity than passed over Teddington Weir, which often fell far below the 130 million gallons. He said the possession of the reservoirs would enable the Board to surrender their rights of abstraction in dry seasons, and thereby secure a great improvement in the river; while the water supply of London would, by means of the reservoirs, be guaranteed. Questioned as to the objections raised to the scheme, witness said with regard to the assertion that the construction of reservoirs Nos. 1 and 2 would have a tendency to create flooding, the idea was ridiculous, because the quantity of water which in time of flood flowed into the gravel was very small—not, he believed, one-twentieth part of the extra quantity taken from the river, so that the danger of flooding would be lessened. Dealing with the existing reservoirs at Hampton and Molesey, witness maintained that what was proposed under the Bill would be of advantage to the river and the public. He said that at Surbiton there was a very long ugly wall with filter-beds lying beside this wall and alongside the river. When the first instalment of the new works was completed, it would be possible to do away with these filter-beds, take down the wall, and leave a picturesque setting. Thus a handsome reach of the river would be enormously improved.

On the resumption of the inquiry on Friday,

The CHAIRMAN intimated that it was the intention of the members of the Committee to visit on Wednesday (to-morrow) the locality affected by the proposals contained in the Bill.

Mr. *Bryan* then continued his evidence. He said that, as the Sunbury reservoir had been abandoned, the scheme comprised the construction of seven reservoirs, having the following capacities: Nos. 1 and 2, near Wraysbury, 5000 million gallons; No. 3, near Horton, 2941 million gallons; No. 4, near Runemede, 2647 million gallons; No. 5, near Staines Moor, 2290 million gallons; and Nos. 6 and 7, near Littleton, 7312 million gallons. The construction of Nos. 1 and 2 would begin in 1912, and would be sufficient to meet all demands until 1923. No. 4 would be begun in 1918, No. 3 in 1922, and No. 5 in 1926. Nos. 6 and 7, to begin in 1928, would meet the demands until 1940.

Replying to Mr. BLENNERHASSETT, K.C., witness said the promoters would be prepared to insert a clause in the Bill to safeguard all the statutory rights of the Woking Water and Gas Company to take water from the Thames.

In cross-examination by Mr. ERSKINE POLLOCK, K.C., on behalf of the owner of the Stanwell Place Estate, witness said the promoters sought to take a considerable portion of land on this estate for the purpose of constructing reservoir No. 5. At its nearest point to Stanwell House, this reservoir would be 26 or 27 feet in height; and it would be commenced about the year 1926. A number of filter-beds were to be constructed on the estate; and this work would commence about the same time as reservoirs Nos. 1 and 2—viz., in 1912. They would begin laying the conduits through Stanwell Place about the year 1914; and about two years after the reservoirs had been commenced, further conduit-pipes would be laid along the property. The large aqueduct No. 1, to Ealing, would be commenced about 1914. He understood the estate was at present being used as a golf course, for which purposes it would be suitable while the works were going on.

Lord ROBERT CECIL, K.C., on behalf of the Herts and Surrey County Councils, suggested that certain alternative sites to the north of Stanwell Place would be more suitable for the works; but witness did not agree with this.

Mr. FREEMAN, K.C., cross-examined witness on behalf of Mr. Redmayne Gregory, owner of River Nook, a property near reservoir No. 2, abutting on the Thames, and through which the Colne flows, and part of which it is proposed to acquire. Witness agreed that the scheme would increase the depletion of the Colne, and that the property would be faced by an embankment, either of the reservoir or of the flood-relief cutting.

In reply to questions by Mr. HONORATUS LLOYD, K.C., on behalf of the Buckinghamshire County Council and other petitioners, witness said he had seriously considered the possibility of utilizing a site in the neighbourhood of the existing Staines reservoirs, in view of the fact that there was a sterilized area there; but he denied that this would have been practicable. He considered that the Thames Conservancy would be perfectly able to deal with any danger of flooding by means of the sluices under their control. The Board would cease to take water whenever the natural flow of the river over Teddington Weir was 140 millions or less. Under the proposed new arrangement with the Conservators, the Board agreed to pay them much more per annum than they were now doing.

The Committee adjourned till yesterday.

LEGAL INTELLIGENCE.

SEQUEL TO A CHARGE OF STEALING GAS.

The full Court of Appeal Judges—the Master of the Rolls and Lords Justices Vaughan Williams, Fletcher Moulton, Buckley, Farwell, and Kennedy—were engaged on Saturday and yesterday in dealing with an interlocutory matter arising out of the case of "Maas *v.* The Gaslight and Coke Company."

Sir F. Low, K.C., for the appellant (the plaintiff) said the action was brought to recover damages for false imprisonment and malicious prosecution. The respondents caused the appellant to be arrested on a charge of stealing gas; and he was tried and acquitted. With regard to malicious prosecution, the respondents admitted that they prosecuted; but they denied that they acted falsely or maliciously, or without reasonable or probable cause. Therefore the onus was on the appellant to prove the absence of reasonable and probable cause. In order to discharge the onus, he sought to administer five interrogatories, two of which were disallowed by the Master, whose decision was now appealed against. By one of these two interrogatories appellant sought to ascertain upon what information the respondents acted when they instituted the prosecution, and what steps they took to ascertain whether the charge was true or not. By the other, he asked for the facts on which the respondents relied as showing that they had reasonable and probable cause for the prosecution.

The appeal was argued for respondents by Mr. ROWSELL.

At the conclusion of the proceedings yesterday, their Lordships reserved judgment.

Contract for the Light Railway at the Harrogate Gas-Works.

Last Tuesday the Court of Appeal were engaged in considering a question arising in the action of "Holme and King, Limited, *v.* Harrogate Gas Company. It was an appeal by the plaintiffs from the order of Mr. Justice Horridge, reversing an order of Master Chitty, staying the action on the ground that the matters in dispute were covered by the arbitration clause. The plaintiffs are railway contractors in the North of England, who had contracted with the defendants for the building of a light railway and sidings into the gas-works—the two contracts being for £8000 and £5200 respectively. The plaintiffs sought to recover the balance due under the contract, amounting to about £1000. The contract provided that all matters in dispute should be referred to the Engineer, Mr. E. W. Dixon, for decision; and as this gentleman had measured-up the work as it proceeded and given what were said to be final certificates, the plaintiffs contended that he was not a fit and proper person to act as arbitrator, as he was really a party to the dispute. The plaintiffs were willing to go to arbitration before an independent man. Their Lordships, without calling on the defendants' Counsel, dismissed the appeal with costs—holding that the Engineer, against whom no imputation was made, was pre-eminently the proper person to deal with the matters in dispute. If any question of law arose upon the contract, it could be raised upon a special case.

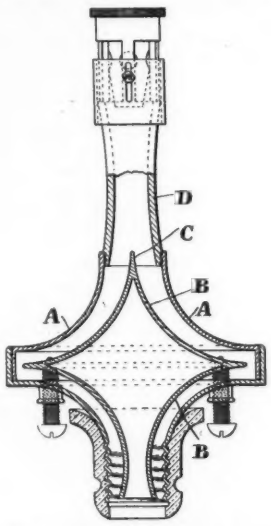
REGISTER OF PATENTS.

Inverted Incandescent Gas-Burners.

GLOVER, R. B. G., of Edmonton.

No. 6507; March 15, 1910.

This invention relates to a preheater for an inverted gas-lamp consisting of an enlarged double-coned chamber placed just above the burner and becoming heated by the uprising products of combustion. The preheater contains a double-coned block, in shape conforming to the inside of the chamber, but leaving a space between so that the gas, in passing to the burner, travels through this space without being materially diverted from the original direction of flow, and issues at the burner in a solid column—the object being to preheat the gaseous mixture and prevent back-firing.



Glover's Preheater for Inverted Burners.

As shown, the heating-box consists of an outer cover A and the "conductor" B. This is made of metal in one or more pieces, either hollow, as shown, or solid. The column of the mixture of gas and air, on entering the heating-box, gets divided by the tapered top portion C of the conductor, and is caused to pass as a film around the narrow space between it and the inside wall of the outer case, and, in consequence, it gets "rapidly and properly heated—the mixture, still as a circular tubular film, emanating from the burner orifice in film form for action on the mantle or other filament." The conductor is positioned inside the chamber so that the gas, in passing through the heater, first moves outwards in film form, and then inwards to the burner still in film form —this movement preventing any flashing-back of the flame.

The patentee states that, in order to increase the velocity of the gas mixture on its exit from the burner, he has shaped the heating chamber and conductor on a plotted temperature curve which approximates to the increments of heat passed to the gas mixture; so that the mixture, as it enters the chamber in film form, is proportionately expanded, and does not lose its velocity notwithstanding the enlarged diameter of the chamber. The curve on the under side of the conductor is of the reverse order; and this underside being much the hotter, the gas mixture is correspondingly expanded and also rarefied. But as the curve now converges towards the outlet, the velocity of the mixture is increased over and above that at the inlet to the chamber D by the difference in density existing between the cold and condensed gas mixture at the inlet and the highly-heated and rarefied, and consequently much lighter, gas mixture at the outlet. The temperature curve selected approximates to the adiabatic curve of an indicator diagram both on the upper and under side of the conductor. By means of this diverging and converging adiabatic curve enclosed within a similar shaped covering box, heat is imparted to the incoming pressure gas mixture in regular and increasing increments from inlet to outlet, so that the velocity of the incoming mixture "is successively and proportionately increased with such certainty that lighting-back is practically impossible, and by reason of the increased velocity of the issuing gas mixture in film form the mantle is better filled, and that with a regenerated and economical mixture."

Extracting Tar and other Bye-Products from Gases.

BURSTALL, F. W., of Birmingham University, and the BRITISH PURE FUEL, LIMITED, of Burton-on-Trent.

No. 6508; March 15, 1910.

It has been previously proposed, the patentees point out, to recover tar or tar constituents from distillation gases by passing the gases through tar-extractors working at temperatures such that water vapour is not condensed; and each extractor gives a tar of different boiling point and character. But the feature of novelty of their invention consists in carrying out the process at a pressure materially below that of the atmosphere—viz., corresponding to a vacuum of 8 to 15 inches of mercury.

The gases from the retort or the like, at a pressure materially below that of the atmosphere, are led into a main kept as warm as possible. The gas is then introduced into a tar-extractor (say, of the static or centrifugal type) which, by proper coverings, is kept at constant temperature. The gas is washed by a stream of hot tar circulated round and round. The temperature of this vessel is always kept above the temperature corresponding to the dew-point of the gas, so that no condensation of water vapour can take place—the gases always being at a pressure materially below that of the atmosphere and corresponding to a vacuum of 8 to 15 inches of mercury. Subsequent tar-extractors may be introduced at different temperatures—the process being the same as in the first case; but in all cases they are kept at temperatures above those corresponding to the respective dew-points. This is, it is said, done so that no water shall condense in any of the tar-extractors. Each extractor will give a tar corresponding to the particular temperature at which it is kept. After leaving the last tar-extractor the gas is allowed to cool; and the liquors and other condensible matters will be passed on to the exhausting pump, which is producing the necessary vacuum.

Gas-Heated Brazing Tables.

RICHMOND GAS STOVE AND METER COMPANY, LIMITED, MEAD, A., of Sheffield, and TAUDEVIN, E. P., of Muswell Hill, N.

No. 8917; April 13, 1910.

This invention has reference to revolving "tables" used for brazing, soldering, or heating metals by means of gas; and its object is generally to improve this type of "table," by heating the articles to a uniform heat before applying the blow-pipe—"thus preventing splitting or warping, which frequently happens when a blow-pipe is applied to one or more parts of a cold article."

The table portion proper on which the article to be operated upon by heat rests, is adapted to be rotated about a vertical shaft supported in a frame which carries also the heating burners of the bunsen type. The support of the table consists of a central spindle, the lower end of which is adapted to revolve in a lower socket or pivot joint; while above this, it is supported by a horizontal member or plate of the supporting frame, and then again above this it carries the main table frame.

In one arrangement, the table has at its edge a circular angle-bar, forming a rim to the table, and within which is a perforated plate, forming the platform for the article to be brazed. Outside this angle rim there is a double casing or apron, extending down some distance below the rim; and into the space within the double walls of this cylindrical apron there is introduced slag wool or other insulator of heat, to prevent the heat passing from the burner or heating portion outwards.

Upon the perforated table is some broken "gas-fire fuel," or the like, which forms a covering to the table, and constitutes a heat receiver and distributor, upon which the article to be brazed is bedded. The heat of the burners strikes the underside of, and is distributed by, the perforated plate; and the "fuel" thus receives the distributed heat, which keeps it at a fairly uniform temperature.

Extraction of Tar from Gases.

FELD, W., of Zehlendorf, Germany.

No. 9086; April 14, 1910. Date claimed under International Convention, April 14, 1909.

Last week, another of the long series of Feld patents was issued from the British Patent Office; and bound up as it is with former inventions in the same name, it will be convenient to give the specification, practically speaking, *in extenso*—premising that there is no illustration of plant accompanying the document.

Recently the extraction of tar from gases has been effected by means of hot tar before the gases are cooled to atmospheric temperature. This process, as described in patent No. 20,139 of 1907, offers no difficulty with gases the temperature of which is kept above the dew-point of water, and in using tar, or tar oils, free of water, as a washing liquid. In many cases, however, in which tar or tar constituents are to be extracted from gases, the gases are saturated with water; and in such cases, tar or tar constituents, mixed with water, will be separated, and the washing effect will be considerably affected. The simultaneous separation of water and tar prevents the fine tarry mist from combining to form drops. In such cases, means must be provided to avoid the simultaneous separation of water and tar.

According to the patent of 1907, the separation of an undesired constituent is generally avoided by raising the temperature of the gases above the dew-point of the undesired constituent, or by lowering the dew-point of the undesired constituent by adding extraneous gases or vapours. But, in order to separate tar or tar constituents from water-saturated gases, the patentee proposes, according to his present invention, to proceed as follows.

The water-staturated gases are, before entering the tar-washer, superheated with regard to water and then treated with the washing liquid, which is also heated to the same, or to a higher, temperature. In the same way he proceeds when extracting tar constituents (for instance, naphthalene) from gases.

The following is an example of the process according to the invention now claimed—presuming that coal gas is to be treated at an elevated temperature for the extraction of tar, and afterwards naphthalene is to be separated. Supposing the dew-point of these gases for tar and tar constituents to be 140° C. and for water to be 70° C., and for naphthalene 30° C., and that these gases come from the mains and coolers saturated with water—that is to say, at 70° C.—a considerable portion of tar, together with a small amount of water, will be condensed in the main and in the coolers. The gases, therefore, will contain water fog, as well as fogs of finely-divided tarry matters. In order to successfully separate tar, by combining the tar fogs to tar drops, means must be provided to ensure that no water is separated with the tar. For this purpose, the gases are, before or when entering the tar-washers, superheated to such an extent as is necessary to evaporate the water fog. Although superheating from 70° to 72° C. would be sufficient, it is better to superheat to or above 80° C. The superheating may be performed by any external or internal supply of heat—for instance, by

pipes heated by steam, or by the hot gases themselves coming from the ovens or retorts, or by waste gases, or the like—using the principle of counter-current; or by introducing into the gases similar, or extraneous gases, or vapours, which are heated to above 70° C., and which are not saturated with water vapour. It will also answer the purpose if the washing liquid be correspondingly heated, and the gases be treated with such a quantity that the necessary heat is supplied to the gases in the washing process.

The amount of heat necessary for the superheating of the water-saturated gases—for instance, from 70° to 80° C.—results from the following calculation: The water-saturated gases at 70° C. have a heat capacity of 0·5 calorie per cubic metre (calculated at zero C. and in a dry state). In order to superheat the gases from 70° to 80° C., 5 calories per cubic metre of gas are necessary. The specific heat of tar (free of water) is also 0·5 calorie. In order to treat one cubic metre of the gases of 70° C. at 80° C. with one litre of tar of 80° C. per cubic metre of gas, the tar must be heated to about 92° C. and then be intimately treated with the gases of 70° C. By this treatment, the gases will be heated from 70° to 80° C. and the tar be cooled from 90° to 80° C. If more than one litre of tar be used for one cubic metre of gas, the tar may be correspondingly less heated; if less tar be used, it must be heated to a correspondingly higher degree.

In case the gases enter the tar-washer containing, as already explained, finely-divided water fogs, the fogs must be evaporated. In this case, the supply of heat and the heating of the tar must be increased accordingly. This will be also necessary if the tar used for the treatment of the gases contains water. In this case, the tar, or the gases, or both, must be heated to an extent to supply the heat necessary to evaporate the water from the washing tar. As long as the gases contain water fogs, or the tar contains water, the extraction of tar is incomplete. By using, over and over again, for the washing process, the tar running from the washing apparatus, and by removing only the excess of such tar, the washing tar will become free of water after some time.

Any suitable apparatus may be used which will allow intimate treatment of the gases with the washing liquid. A convenient apparatus is such as is described in patent No. 11,206 of 1905. Or exhaust apparatus, or fans, by which the washing liquid is injected, or centrifugal apparatus of any suitable kind, or injectors, or spraying apparatus, and the like, may be used for the purpose. In order that the last traces of tar may be extracted from the gases, a Pelouze apparatus may be employed in combination with the gas-washer. Means should be provided to ensure that the gases are not cooled to the dew-point for water if they pass this apparatus; and, for this purpose, it is convenient to have the apparatus and pipe connections, by which the gases pass in the washing process, protected against cooling effects by insulation, or to have the gases so far superheated that they are not cooled to the dew-point of water saturation while they are passing the tar extractors.

After the treatment described, the gases will be free of tar at 80° C.; but they will be saturated with tar oils of high boiling points according to their quantity and point of evaporation. It will be the same with gases whose dew-point as regards water is above or below 70° C.

After the extraction of tar, the gases may be conveniently treated for the extraction of cyanogen, sulphuretted hydrogen, and ammonia. In order that in these operations no tar oils shall be separated, the gases should be again raised (according to patent No. 20,139 of 1907) above the dew-point of the tar oils left in the gases. As the washing liquids are such as contain water, the gases which were superheated in the tar extraction will again be saturated with water. The dew-point of the gases for tar oils should therefore be lowered by adding gases, or by injecting vapours, which may be done according to patents Nos. 27,567 and 28,390 of 1907. The extraction of ammonia may be conveniently performed by acids, or by salt solutions, eventually simultaneously with the cyanogen—for instance, according to the patent No. 966 of 1904, or by any other suitable process, at 70° C. or above. After adding gases which contain only a small quantity of tar oils, the extraction of ammonia may, if desired, be performed at a lower temperature than 70° C. without tar oils being separated. After the gases have thus been freed from tar, cyanogen, and ammonia, they must be cooled. In cooling below 70° C., tar oils will be separated according to patent No. 20,139 of 1907; but the amount of these tar oils is but small in coal gases.

As the dew-point of the gases for naphthalene lies at about 30° C., there is the danger that the small amount of tar oils separated when the gases are cooled from 70° to 30° C. will not be sufficient to dissolve the naphthalene deposited at 30° C. In cooling, water will be separated, as well as tar oils, according to the lowering of the tension of water vapour from 70° to 30° C., and therefore the tar oils separated will contain water, whereby their washing and dissolving efficiency will be affected. If this be the case, the gases are, in the first instance, only cooled to 30° C., and then they are, according to this invention, treated with a washing medium for the extraction of naphthalene. The treatment already described for the extraction of tar at 70° C. is now effected at 30° C. in such a way that the gases which are water-saturated at 30° C. are superheated and then treated with the washing liquid, in order to prevent the separation of water and the reduction of the washing efficiency. The operation is the same as has been described for the tar extraction. In this present case, superheating of the gases from 33° to 36° C. will be sufficient, although it may be higher; but then the dissolving power of the washing liquid for naphthalene will be diminished.

Any solvent for naphthalene may be used as a washing liquid; but it is preferable to employ for this purpose high boiling tar oils or tar which may be those obtained by the previous treatment of the gases. After the extraction of naphthalene is performed, the gases may be cooled to the desired temperature without any danger of obstruction by naphthalene. The small amount of naphthalene which might be deposited will be dissolved by the tar oils condensed simultaneously.

Instead of the separate extraction of tar at, or above, the dew-point of the gases for water, and of naphthalene at the dew-point, part of the tar may be condensed with the water when the gases are at a temperature near the dew-point of naphthalene. The gases will then contain tar and most of the naphthalene; and these will be removed if the gases be superheated and washed in accordance with the process described.

If, in the process for extracting tar, tar oils or tar be used containing much medium or light oils of low boiling points, and if the washing liquid be strongly heated before entering the gas washers, a corresponding amount of vapours of the oils will be incorporated with the gases. In this case, when afterwards cooling the gases to the dew-point of naphthalene, the oils will be separated simultaneously with the naphthalene, which will therefore be dissolved, and consequently special treatment of the gases for the extraction of naphthalene will not be necessary.

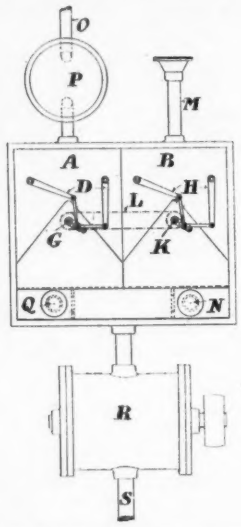
Mixing Air and Gas.

NETHERCLIFT, E. H., of Nottingham.

No. 10,888; May 3, 1910.

This invention has reference to apparatus, in which gas and air are measured by separate instruments, used in connection with high-pressure gas lighting.

Dry gas-meters are used as measurers; and there is one meter for measuring the gas and another for the air. The crank or valve actuating shafts of the meters are coupled together by positive driving gear; and the cranks to which the meter top levers are connected are provided with slots, so that the extent of the movement of the measuring chambers can be varied according to the required proportions of air and gas. The inlet pipe to the gas measurer has a diaphragm or equivalent reducing valve, whereby the pressure of the gas entering the measurer is automatically reduced to the pressure of the atmosphere, and is varied with the changes in atmospheric pressure.



Netherclift's Air and Gas Mixer for Pressure Lighting.

The two dry meters A B are fastened together and enclosed in a covered box. The top levers D of meter A are coupled to a crank on the valve-actuating spindle G, and the top levers H of meter B are coupled to a crank on the valve-actuating spindle K. The spindles are geared together by a chain L and toothed chain wheels. The cranks are provided with slots to allow of the position of their pins to be varied, and consequently the extent of the movement of the measuring chambers of the meters, whereby the proportions of air and gas measured by the meters may be varied according to the quality of the mixture required. The meters may have the same measuring capacity, or the relative proportions of the measuring capacities of the meters may be approximately the same as the proportions of the air and gas required in the mixture, or the ratio of the gearing between the meters may be the same as the proportions of air and gas required for the mixture or proportionate to the sizes of the meters and the ratio of the gas and air required. The meter B, for the air, is provided with an inlet pipe M, provided with a gauze covering at the end to prevent the admission of dust and the like; and there is a non-return valve N at the delivery outlet. The gas-supply pipe O is provided with a diaphragm or reducing valve P, by which the pressure of the gas admitted to the meter A is reduced to the pressure of the atmosphere, and is automatically varied according to changes in the pressure of the atmosphere; and there is preferably a check or non-return valve Q at the gas-delivery outlet.

The gas and air delivered by the meters pass through the valves Q and N to a rotary or other suitable compressor R by which they are thoroughly mixed, and delivered to a supply pipe S at a pressure suitable to the system of lighting adopted.

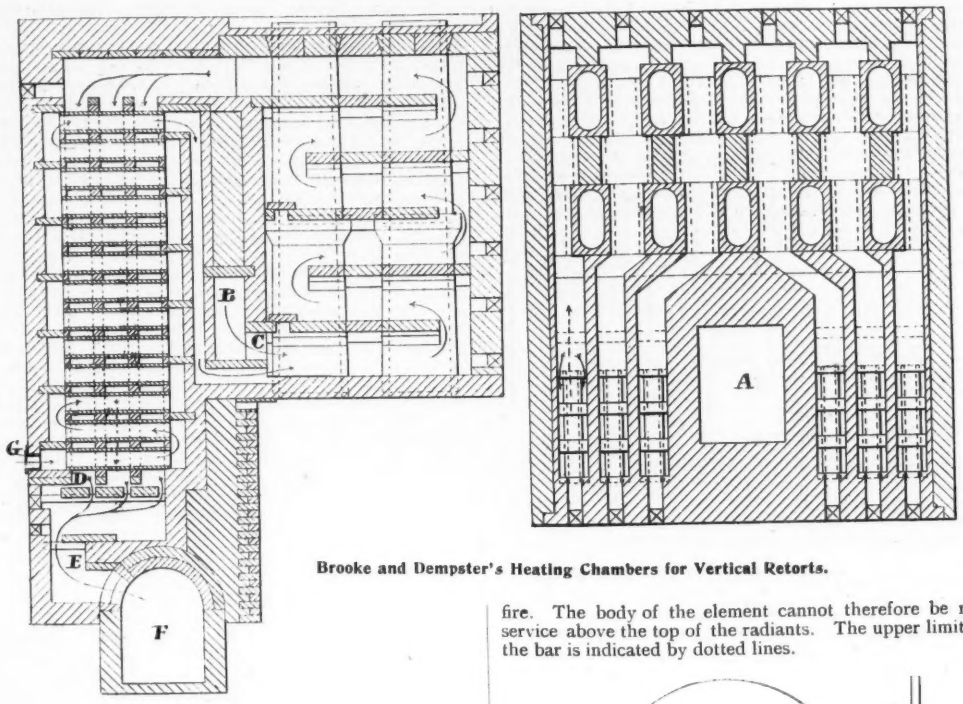
Gas-Retorts.

ROBERT DEMPSTER AND SONS, LIMITED, and BROOKE, R. M., of Elland.

No. 9408; April 19, 1910.

This invention relates to settings for vertical retorts of the type in which the setting is divided into separate and independent vertical chambers or compartments where all the retorts are built into the vertical walls dividing the setting into such compartments; and the said invention consists primarily in the combination therewith of separate regenerators, flues, and dampers for each compartment of the setting.

In Brooke's patent, No. 14,637 of 1906, were described means for



Brooke and Dempster's Heating Chambers for Vertical Retorts.

regulating the supply of secondary air to each of a number of zones surrounding several horizontal retorts, and the exhaustion of waste gases from each of such zones; and in patents Nos. 16,405 of 1908 and 1937 of 1909 like arrangements with regard to horizontal zones embracing vertical retorts. According to the present invention, to each vertical compartment so constructed means are applied for subdividing and separately controlling the currents of air and gases similar in principle to those previously applied to horizontal compartments or horizontal retorts.

The regenerators may extend to the top of the setting; each regenerator having separate secondary air-flues for each vertical compartment and separate waste-gas flues fitted with dampers for each vertical compartment. By this means, the heat in the various compartments of the setting is said to be under better control than has hitherto been the case with vertical retort-settings of this description, and enables any section of the setting to be put out of action for slight repairs, or to meet a decreasing demand for gas where the demand fluctuates at different parts of the year, while the rest of the setting is at work.

The setting shown is of ten retorts, divided by five vertical walls into six vertical heating chambers or compartments, each of which is supplied with secondary air through a separate regenerator. The producer gas passes from the producer A to an intermediate chamber B extending across the setting to its full width, and communicating with each heating chamber separately through a port C. The exhaust gases from each chamber pass between prolongations of each of the vertical walls to the spaces at each side of the air-tubes of the regenerator through which is supplied secondary air to the same chamber, downward through ports D (capable of being regulated by separate dampers), and thence through a port E (controlled by a large damper) into the main flue F, as indicated by the arrows.

The draught on each compartment of the setting being regulated at the ports E, and the supply of secondary air to each compartment being regulated by the usual dampers G of the regenerators, a proportionate amount of producer gas, according to requirements, will naturally be drawn into any particular compartment; and the heating of each individual compartment can thus, it is remarked, be controlled with considerable precision.

Gas-Fires.

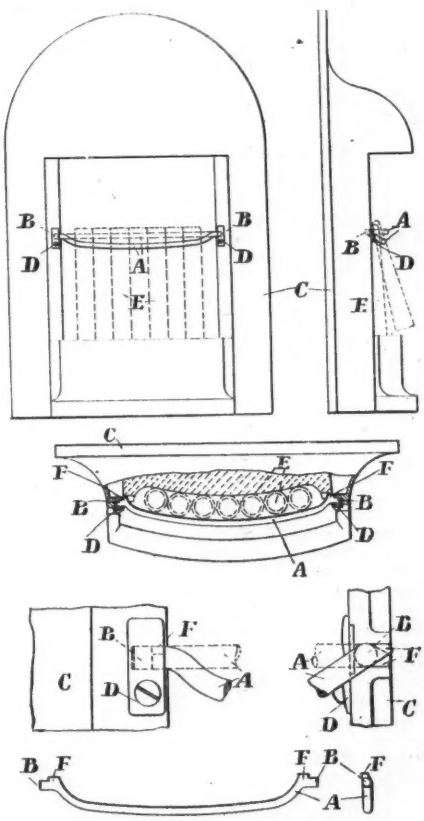
YATES, H. J., of Aston, near Birmingham.

No. 11,675; May 11, 1910.

To provide effective means for retaining the "radiants" of gas-fires in position, the patentee proposes to use "a pivotally mounted or like movable retaining element which is automatically maintained in contact with the radiants, is self-adjusting to suit variations in the radiants and to meet expansive movements due to heat, and permits of ready removal of any portion of the radiants without risk of disturbing the whole."

The retaining element consists of a bowed bar or strip A somewhat similar in form to an elongated letter U, and with end projections B supported in apertures in the framing C of the gas-fire. The bar is held in position by plates D attached to the framing. When the gudgeons B are placed in their bearings, the body of the retaining element embraces the whole of the radiants as E (indicated by dotted lines), and, under the influence of gravity, tending to bring the main portion to the lowest possible position beneath its gudgeons as shown by the full lines, a sufficient lateral pressure is imposed on the radiants to maintain them in their correct position against the refractory back of the fire.

The total movement which can be imparted to the retaining element about its fulcrum is limited by a stop F, formed on the bar adjacent to each gudgeon and situated in a slot or groove in the framing of the fire. The body of the element cannot therefore be raised when in service above the top of the radiants. The upper limiting position of the bar is indicated by dotted lines.



Yates's Gas-Fire.

The provision of such a stop, the patentee remarks, while in no way preventing the necessary movement of the retaining element to permit of withdrawal or replacement of any radiant that may be broken or damaged, will avoid any risk of the falling away of the other radiants in the apparatus. A radiant is shown in one place in the partly inserted or withdrawn position.

Gas Heating-Stove.

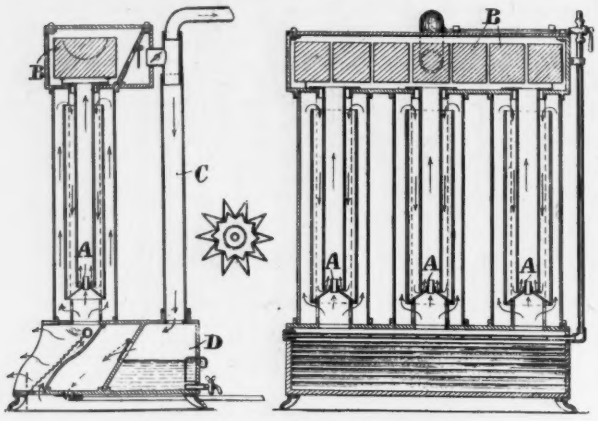
GROSSER J., and FLEISCHER J., of Wiesbaden, Germany.

No. 15,488; June 28, 1910.

The characteristic features of this stove are that separate heating bodies are formed by combining concentrically arranged tubes of star-shaped cross section with an inner central cylindrical tube, and placing it in direct communication with a heating chamber fitted with a concentric tube leading into the central tube for producing circulation.

The top and bottom portions of the stove are connected by a plurality of heating bodies, consisting (as shown) of an outer star-shaped tube with long pointed triangular rays into which is fitted another star-shaped tube with short or shallow points. The channels formed between these

tubes open into the heating chamber at the foot, and form the first flue for the ascending gases. In the inner tube depends a tube secured to the upper portion and open at its lower end. The two tubes form a second flue, in which the heated gases descend and then pass upwards, and escape through a pipe into the chimney.



Grosser and Fleischer's Gas Heating-Stove.

In order to prevent stagnation of the heating gases in the interior of the heating body, the inner tube has a small induction tube A directly connected with the heating chamber below, from which a portion of the burnt gases ascend and act as an inductor for gases from the flue.

For the purpose of utilizing the heat from the gases as far as can possibly be done, the upper portion is furnished with a series of blocks B (of fire-clay or like refractory material), which at the same time serve for drying the spent gases, and so preventing condensation as far as is possible. They may have a recess for catching condensation water, which, entering the outlet tube, runs down the pipe C and collects in the chamber D at the foot.

Incandescent Gas-Burners.

MANSFIELD, A., of Liverpool.

No. 20,343; Aug. 31, 1910.

The incandescent burner here referred to consists of a combination of an interchangeable nipple, with a gauze protector surrounding it, through which the air passes to the mixing-chamber in a direction parallel with the flow of gas from the nipple, and which constitutes the only air opening into the air-chamber. Further details of the invention are not needed, as it was fully described and illustrated in the "JOURNAL" for Oct. 18 last, p. 195.

Gas Analysis Apparatus.

SIMMANCE, J. F., of Westminster Palace Gardens, S.W., and ABADY, J., of Fountain Court, the Temple.

No. 26,168; Nov. 10, 1910.

This invention relates to apparatus for the volumetric analysis of a gaseous mixture, of the type in which a bell carrying a vent-pipe is caused to rise and fall periodically in a liquid seal; the rise of the bell drawing in an excess volume of the gas to be analyzed, and the fall of the bell causing a predetermined volume of this gas to be discharged through some absorbent reagent to a second or recording bell—the volume of gas delivered to the recording bell giving the desired estimation of the constituent of the gaseous mixture which is the object of the analysis.

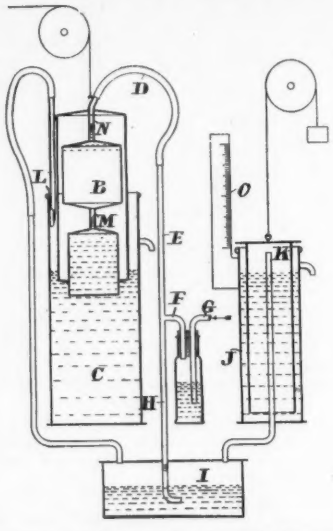
The invention particularly relates to the arrangements for venting and sealing off the desired volume of gas automatically corrected to standard pressure, and for passing it through the absorbent reagent to the recording bell. By the invention, it is said that errors due to variation of the working conditions of the apparatus are reduced to a minimum, while the apparatus is more easily adaptable to analyze gases at higher pressures or higher partial vacuums than in previous apparatus of this type. It has been found that variations of as much as 6 inches water pressure or vacuum have no appreciable effect upon the amount of gas discharged through the reagent to the recording bell, but that any alteration in the amount of the constituent to be arrested by absorption is recorded.

The diagram given is not intended to show the structural form of the various parts, nor their relative position in the complete apparatus. It consists of a bell suspended in a liquid seal and caused by its rising movement to extract or suck a charge of the gaseous mixture from the source of supply, and by its falling movement to deliver the charge to the apparatus by which it is analyzed. This "extractor bell" B dips into a liquid seal contained in the tank C; being suspended by a wire or cord passing over a beam or pulley. A pipe D at the top of the extractor bell communicates by a flexible pipe with the inlet pipes E, F, G, by which the gaseous mixture is led from the source of supply. A liquid seal bottle serves to close the end of the inlet pipe G. A branch pipe H is led from the junction of the pipes E F to a tank I in which the absorbent liquid reagent is contained; the lower end of the pipe H dipping below the level of the liquid. A pipe leads from the top of the tank, through the bottom of another tank J, to the inside of the recording bell K; the open end of the pipe being above the level of the liquid in the tank J. The recording bell is suspended by a wire or cord passing over a pulley, or from the end of a balance beam. A vent-pipe L is rigidly attached to the extractor bell; its upper end communicating with a pipe leading to the top of the reagent tank I. The lower end of the vent pipe is open; and when above the level of the liquid in the tank C, it ensures that the pressure of gas in the absorbent tank I and inside the recording bell K are equal to that of the atmosphere.

The illustration shows the extractor bell B lifted into its highest position. If the source of supply of the gaseous mixture to be analyzed is a partial vacuum, there will be a difference of the levels of the liquid inside and outside the bell corresponding to the partial vacuum, *plus* the constant head in terms of the liquid in the vessel C corresponding to the difference of level between the lower end of the tube G and the level of the liquid in the liquid seal bottle.

Before the bell has completed its upward stroke, the lower end of the vent-pipe L rises out of the liquid in the tank C, the pressure on the surface of the liquid in the tank I becomes equal to that of the atmosphere, and the liquid rises in the tube H. At this instant, the pressure inside the recording bell K becomes equal to that of the atmosphere. The counterweight is so adjusted that the recording bell begins to descend, and the analyzed gas is expelled through the tank I, and finally escapes into the atmosphere. The recording bell K is shown in a position just before reaching the bottom of its stroke.

When the extractor bell B begins its downward stroke, the pressure of the gas inside the bell soon reaches that of the atmosphere; and the levels of the liquids inside and outside the bell, and in the pipe H, and tank I become equal. On the bell descending further, part of the gas is discharged through the absorbent liquid in the tank I, and escapes into the atmosphere. The liquid seal bottle prevents the escape of gas along the pipe G towards the source of supply.



Simmance and Abady's Gas Analysis Apparatus.

When the lower end of the vent-pipe L has dipped a certain depth into the liquid in the tank, the further escape of gas is prevented. At this instant, the liquid inside the bell B has attained some relative level; and on the further descent of the bell, the gases, after bubbling through the absorbent liquid in the tank, finding no outlet pass along the piping and lift the recording bell K. During this stage, the level of the liquid inside the extractor bell is lower than outside, by an amount corresponding to the pressure necessary to force the gas through the absorbent liquid in the tank I, *plus* the pressure necessary to lift the bell K.

The relative capacities of the extracting and recording bells and the situation of the open end of the vent-tube are so arranged that the sealing-off and completion of stroke levels M N relative to the bell B occur at such points that (assuming the gas to contain no constituent absorbable by the reagent in the tank I) a charge of gas of volume equal to that between the levels M N is passed to the bell K through the tank I at each downward stroke of the extractor bell.

The gas measured off in the bell B is at a higher pressure than that delivered into the bell K. The length of the scale O indicating the stroke of the recording bell is such that, if no gas is absorbed during its passage through the tank I, 100 divisions of the scale will correspond to the total quantity of gas measured off in the extractor bell. A final adjustment of the counterweight, and therefore of the pressure of the gas delivered to the inside of the recording bell, "serves to attain this agreement to the highest degree of accuracy." The readings given by the rise of the recording bell at the scale will therefore be correct, irrespective of any variation of pressure at the source of supply of the gaseous mixture.

Reductions in Price.—The Directors of the Shotley Bridge and Consett District Gas Company have reduced the price of gas 2d. per 1000 cubic feet to both the ordinary and the prepayment meter consumers. The change came into force on the 1st inst. The Torquay Gas Company have, as from the 25th ult., reduced their price 2d. per 1000 cubic feet to ordinary consumers and to users of gas-engines; and they will in future allow discount of 3½d. instead of 1½d. in the shilling to consumers having prepayment meters. At their last meeting, the Directors of the Newport (Mon.) Gas Company decided to reduce the price of gas 2d. per 1000 cubic feet from the 31st ult. The Windsor Gas Company have decided to reduce the price of gas 2d. per 1000 cubic feet from the 1st of July next. The Littlehampton Gas Company have reduced their price 1d. per 1000 cubic feet. The Directors of the Daventry Gas Company have decided to lower their net price from 4s. 2d. to 3s. 11½d. per 1000 cubic feet. The charge has hitherto been 4s. 7d. with a discount of 5d. As from last Friday, the price of gas at Pangbourne will be reduced by 2d. per 1000 cubic feet.

MISCELLANEOUS NEWS.

RECOVERING COST OF ALTERING DEPTH OF MAINS.

At to-day's Meeting of the London County Council, the Highways Committee will present a report recommending the payment to the Gaslight and Coke Company of the costs they had incurred in opening up some of their mains, in consequence of the Council having, when altering the levels of a bridge in the Barking Road, buried the pipes to a much greater depth than formerly. The circumstances are stated in the following report.

Barking Road Bridge was reconstructed by the Council between 1893 and 1896, and was opened in July of the latter year. In connection with the work it was necessary to raise the levels of the approaches to the bridge, so that some large mains belonging to the Gaslight and Coke Company, under the western approach, became buried to a very much greater depth than they were previously. In November, 1894, an agreement was entered into between the Council and the Company providing that whenever the Company desired to obtain access to these mains by opening up the roadway, the Council should reimburse the Company any extra expense devolving upon it in consequence of the greater depth of the mains. From September, 1910, to January, 1911, the Company found it necessary to open up nearly fifty joints of certain large high-pressure mains in the road in question; and it has now forwarded an account amounting to £181 10s. 6d. in respect of the cost of the extra excavation caused by the altered levels of the road. We are advised that this amount is reasonable. We therefore recommend—

(*a*) That, as a matter of urgency, the special estimate of expenditure in the financial year 1910-1911 on maintenance account of £181 10s. 6d. submitted by the Finance Committee in respect of the repayment to the Gaslight and Coke Company under the agreement, dated the 10th of November, 1894, of the additional expenditure incurred by the Company in connection with the opening up of the roadway on the western approach to Barking Road Bridge, for the purpose of obtaining access to the Company's mains, be approved as an estimate of costs, debt, or liability under the Local Government Act, 1888.

(*b*) That expenditure on maintenance account of £181 10s. 6d. be sanctioned for the purpose specified in the foregoing resolution (*a*); and that the matter be referred to the Finance Committee with a view to payment.

The Finance Committee, having considered in its financial bearings the above-mentioned estimate, submit it as chargeable to maintenance account in respect of the financial year 1910-1911.

The above decision is of peculiar interest at the present time, in view of recent discussions in the Parliamentary Committee-rooms, on the question of the depth of gas-pipes, in connection with the Tamworth and Enfield Gas Bills, and the abortive attempts on the part of the Staffordshire, Warwickshire, and Middlesex County Councils to obtain statutory authorization to compel the payment by the Gas Companies of the costs of changes in the position of gas-pipes necessitated by alterations of roads.

KIRKCALDY GAS-WORKS PURCHASE ARBITRATION.

The Award of the Oversman.

The questions in the arbitration to fix the price to be paid by the Corporation of Kirkcaldy for the undertaking of the Kirkcaldy Gaslight Company, Limited,* having devolved upon the Oversman (Lord Shaw of Dunfermline), in consequence of the Arbiters (Mr. Corbet Woodall and Mr. Arthur Silverthorne) having failed to agree, the decision of the Oversman was issued last Thursday, in the following terms.

"The Oversman, having considered the claim No. 18 of process, answers thereto No. 12 of process, statement of fact contained in No. 12 of process, and answers thereto contained in No. 18 of process, together with joint minutes for the parties No. 81 of process, record in Court of Session action, No. 23 of process, proof adduced, productions, arguments of counsel, and whole proceedings, including minute of devolution, No. 140 of process, proposes: (1) To find, with regard to the action mentioned in Article 1 of the joint minute, (*a*) that the parties have settled the questions therein raised, other than the expenses of the action, and that it is not necessary for the Oversman to give any findings on the merits of the action; and (*b*) the claimants (the Kirkcaldy Gaslight Company, Limited) liable to the respondents (the Provost, Magistrates, and Councillors of the Royal Burgh of Kirkcaldy), in the expenses of the action, as the same shall be taxed by the Auditor of the Court of Session. (2) To find and determine on the matters submitted in Article 3 of the joint minute as follows—viz., (*a*) that the undertaking within the meaning of the Burghs Gas Supply (Scotland) Act, 1876, does include the items under the heads "By Cash," "By Stocks," and "By Sundry Debtors" on the creditor side in Table E in No. 30 of process, and also the item of "Gas in Stock" on May 31, 1910; and (*b*) that the respondents are not bound, on taking over the undertaking as from May 31, 1910, to pay to the late Manager of the Kirkcaldy Gaslight Company, Limited, the pension referred to in the pleadings in the arbitration—the price having been calculated on the footing that the claimants do pay the pension, or settle in respect thereof with the pensioner (Adam Macpherson) out of the sum awarded. (3) To fix the price to be paid by the respondents to the claimants for the undertaking of the Company, and all the rights, powers, and privileges, and all the lands, premises, works, and other property of the Company, including, without prejudice to the foregoing generality, the items mentioned in Article 3 (*a*) of the joint minute, at the sum of £137,150, whereof £11,049 represents the items mentioned in Article 3 (*a*) of the joint minute. (4) To fix that the undertaking, and all the rights, powers, and privileges, and all the lands, premises, works, and other property of the Company shall be taken over by the respondents at the foresaid price, under burden of the feu-duties or ground annuals affecting the lands and premises, so far as accruing from and after May 31, 1910. (5) To fix the respondents' entry to the lands, premises, works, and others, in terms of the agreement of parties contained in the joint minute, at May 31, 1910, from which date the transfer shall take effect, and the lands, premises, works, and others shall be taken to have been held for the respondents, and the undertaking to have been carried on for their behalf. (6) To fix the rate of interest to be paid, as mentioned in Article 7 of the joint minute, at 4 per cent. per annum. (7) To find the respondents liable in the expenses of the arbitration as the same shall be taxed by the Auditor of the Court of Session."

Further, the Oversman allows either party to lodge representations against these proposed findings with the Clerk to the Reference—Mr. Norman Macpherson, S.S.C., of Edinburgh—within eight days.

* See "JOURNAL," Vol. CXIII., pp. 107, 174, 238, 614, 706, 782.

POSITION OF THE COALITE COMPANIES.

British Coalite Company, Limited.

It will doubtless be remembered that towards the close of last year the general meeting of the British Coalite Company was held at Salisbury House, E.C., under the presidency of Sir William H. Preece; and that it was then mentioned that, as important negotiations were in progress which materially affected the shareholders' interests, the Directors had decided that it would be inadvisable to make any statement with reference to them. The proceedings were accordingly adjourned till the 30th of March. Mr. James Todd presided at the meeting last Thursday, and announced that the negotiations referred to on the previous occasion had reached a point which justified the Directors in anticipating a favourable result at an early date. As Sir William H. Preece was away in South Africa for the benefit of his health, and could not return until the 23rd inst., the meeting was further adjourned until the 26th.

Coalite, Limited.

In the report which the Directors of this Company will present at the ordinary general meeting next Thursday, they state that the financial position of the concern has been much improved by the adjustment of the liability of £170,609 to the British Coalite Company, Limited, which has been discharged under an arrangement made to the benefit of both Companies. It is pointed out that the prosperity of the British Coalite Company is necessarily of considerable importance to Coalite, Limited, holding as it does 134,094 fully-paid ordinary shares and 456,500 fully-paid deferred shares in it. The Directors are therefore glad to be able to report that, after passing through a somewhat critical period, the affairs of that Company are now "in an improved position and on a businesslike footing."

The report is accompanied by the following statement prepared by the Managing-Director of the British Coalite Company, Mr. Herman Clarke:

Upon assuming the position of Managing-Director in July last, I made a careful and exhaustive examination into the Company's affairs, particularly into the process of manufacture and the location of plant, the staff, and the handling and sale of the Company's products. The results of this examination showed very clearly: (1) That, while the process in itself was of great value, the actual manufacture and the handling of the output was being carried on under crude and on expensive lines, without regard by the technical staff to the advantages of the coalite system and of modern and well-known principles of carbonization. (2) That, with the exception of the Barking plant, the works of the Company were located at points where the local conditions made the manufacture of coalite upon commercially profitable lines an impossibility. These faults have been corrected as far as it is possible up to the present time. The works at Plymouth and Hythe have been discontinued, and the contracts with the Gas Companies at those points cancelled upon fairly advantageous terms. At Barking, where the entire operations of the Company have now been centred, and the plant gradually brought to an up-to-date condition, the working and clerical forces have been greatly reduced. At Wednesfield, the entire staff has been discharged, and the plant closed down.

There have been certain changes in the method of manufacture, and at present we are working upon lines which produce commercial products of established value. These changes, with a carefully kept and carefully checked record, have, we are advised by our Patent Agents, greatly strengthened the position of our patents. The Company is gradually taking over the distribution of its output direct to the consumer; thereby avoiding uncertainty of distribution, and assuring a regular and prompt delivery both in quantity and quality. Without going into the details of cost and profit, I can certify that, under a continuance of the present method of manufacture and business management, this Company can earn 4s. per ton net on every ton of coal carbonized; and, as our experience broadens, this profit can probably be exceeded.

Future Lighting Developments.—One of the "Notes for Gas Users" in a recent number of the "Ironmonger" contained some observations on the above subject (translated from an Austrian publication) by Professor Wedding. He thinks that in the future the aim will be to distribute light better from a number of small sources rather than from lamps of very high candle power. Until the present time, the tendency has been to produce more and more powerful sources of light; and in many cases too great an intensity has been arrived at. These views apply, perhaps, specially to the lighting of interiors. Respecting the lighting of streets, Professor Wedding said: "High-pressure gas seems to me to possess very considerable advantages over other systems of lighting. By this means we can readily produce sources giving a light of several thousand candle power. The arc lamp already holds its position with difficulty against high-pressure gas, and incandescent lamps even more so."

CO-PARTNERSHIP IN THE GAS INDUSTRY.

The following table has been compiled by the Labour Co-Partnership Association, to show the extent to which the principle has been adopted in connection with gas companies—the figures being brought up to the end of last year. The matter was referred to by Mr. Henry Vivian in the course of a paper presented at last week's meeting of the Association, as recorded on another page.

Referring to this table, the Committee of the Association, in their report, say: It is noticeable that there is a distinct rise in the rate of dividend on wages which comes to labour. The table shows clearly the success of co-partnership as a commercial speculation, though this is certainly not the only benefit which accrues through its adoption. It shows also the continued success of the oldest profit-sharing Gas Company, the South Metropolitan, whose wage-dividend amounted to £41,000 last year. This Company's workers up to the present have received over half-a-million pounds' worth of profit since the inauguration of the scheme; but this is not the whole benefit received by the workers, as various funds are worked by the Co-Partnership Committee. One such fund (the Mutual Aid and Benefit Fund) gave last year £549 to hospitals and £474 to members—that is, £1023 altogether. The largest of these Companies—the Gaslight and Coke—have been equally successful; and in 1910, the second year of their profit-sharing scheme, they distributed £37,700 among their 8700 employees. The following particulars which have been kindly forwarded to us concerning the Newport (Mon.) Gas Company may be of interest.

This is a "standard price" Company, and so the system is not open to the fluctuations possible in the case of a sliding-scale of prices. The permanent workmen of this Company are invited to enter into a yearly agreement for efficient and faithful service, in consideration of which a bonus is guaranteed as follows:—

For the first year of service, 52 weeks at 6d. = £1 6s. 0d.
For the second year of service, 52 weeks at 9d. . . . . = £1 19s. 0d.
For the third and all subsequent years of service, 52 weeks at 1s. . . . . = £2 12s. 0d.

The bonus is placed to the credit of the employees in the Company's Thrift Society, which pays 4 per cent. interest on all moneys credited; and employees are encouraged to invest their accumulated savings in the stock of the Company.

Particulars of Co-Partnership and Profit-Sharing in British Gas Companies at Dec. 31, 1910.

Name of Company.	No. of Years Scheme has been in Operation.	Capital in 1910. Total Share and Loan.	No. of Employees under Agreement for Profit-Sharing or Co-Partnership.	Amount Divided among Employees for Year ending Dec., 1910.	Amount per Cent. on Wages.	Total Profit to Employees since Scheme was adopted.	Amount of Shares and Deposits held by Employees in the Company. Market Value on Dec. 31, 1910 (about).
		£		£		£	£
(*a*) South Metropolitan	21	8,325,340	5,459	41,133 June	8½	505,675	461,038
Commercial	10	2,548,280	1,223	8,996 June	5*	84,234	49,164
(*b*) South Suburban	17	831,363	578	3,463	6½	36,914	36,069 June
Newport	11	336,337	142	364	3·71	3,917	4,791
Chester	9	243,941	65	289	5	1,031	1,107
Leamington	3	79,790	112	406 June	5	1,031	1,107
Rugby	2½	59,327	45	190	6	620	3,620
Walker and Wallsend	2½	271,918	101	369 June	4	910	3,690
Wrexham	2	136,120	61	341	7½	931	480
Tunbridge Wells	2½	178,266	137	545	5	1,193	1,483
Tottenham	2½†	753,410	617	3,002	6	10,473	12,144
Croydon	2	693,921	514	1,405	3½	3,250	5,068
Gloucester	2	228,302	113	416 June	5½	802	None
Bournemouth	2	759,783	393	1,809	5½	3,417	4,856
Wellingborough	2	90,853	60	247 June	5	498	487
Gaslight and Coke	2	29,172,991	9,010	25,799 June	3½	64,482	70,310
Dartford	2	101,929	41	170	4	334	334
Grantham	1¾	106,068	47	116	3½	254	257
Cardiff	1½	679,234	233	749 June	4	1,439	1,647
Watford	13	170,784	106	742	—	702	460
Carmarthen	1½	17,200	14	55	5½	79	None
Waterford	1	70,000	64	126	6	126	66
Weston-super-Mare	2	101,543	75	211	3·8	362	None
Epsom	3	86,564	34	102	—	322	524
Ilford	1½	280,505	169	569	3½	844	1,034‡
Cambridge	1½	194,258	167	761	6	1,111	353
Wandsworth and Putney	½	508,542					
Longwood	¾	101,504	33	—	4	—	—
		47,130,073	19,613	92,105		726,126	600,776

* Now 6 per cent. † First bonus antedated three years. ‡ As well as other stock acquired by workers independently of scheme. (*a*) There are three employee representatives on the Board. (*b*) There are two employee representatives on the Board.

MR. BALFOUR BROWNE ON WATER SUPPLY.

As briefly recorded in the "JOURNAL" last month (p. 839), a lecture on "Water Supply" was delivered by Mr. J. H. Balfour Browne, K.C., at the Royal Institution.

In introducing his subject, the lecturer emphasized the importance of the question of the future water supply of London by referring to the fact that water is now collected and sold in England to the value of nearly £8,000,000 annually, and that it costs about 2d. a ton delivered at the house of the consumer. The improvident way in which sources of water had been squandered in the past, the appropriation of sources which might not naturally or geographically belong to the community taking them, the exhaustion of local sources, and the waste of underground water in connection with mining operations, had made the future of this country as to water supply precarious and serious.

There were in some quarters objections to rivers as a source of supply, largely due to the fact that communities had thrown their refuse and filth into streams, and made them the carriers of sewage. But even this insanitary indiscretion was condoned by Nature; and rivers, especially rapid and turbulent streams, burnt off effete matter which was put into them. Notwithstanding the supply of river water to London, its health was always exceptionally good. It was for this reason that the Metropolitan Water Board had abandoned the idea of going to Wales for its supplementary water supply, and proposed to obtain power to construct in the Thames Valley a series of reservoirs for the purpose of decanting the raw river water at Staines, and to spend £6,900,000 on the scheme, which was to supply the wants of Greater London for the next thirty years.

In the case of spring waters, these were collected in protected tanks, whence the water, which in many cases had been sufficiently filtered by Nature, was conveyed to a clear-water tank as in the case of surface water. But when, as in the case of surface water, there was liability to surface pollution, filtration was a necessity. An examination of Thames water at Hampton showed there were 1644 micro-organisms in 20 drops of water; and the Thames water, after passing through the sand filters, was found to contain only 13 such organisms in the same number of drops.

There was at the present time a good deal of sporadic information as to the water supplies and resources in various localities; and mining engineers had, from their experience, some knowledge of the subsoil or underground waters, for these were the enemy with which they had to contend in their operations. But there was no general survey to determine what were the supplies and the water resources of this country; there was no general knowledge as to the underground supplies. The necessity for the acquisition of a comprehensive knowledge both of the overground and underground reserve forces for water supply was emphasized by the proceedings and report of the Royal Commission which had been inquiring and reporting upon canals and waterways since the year 1906. There was a Royal Commission on Water Supply in the year 1869; and there was a Select Committee on the Public Health Act, 1875, Amendment Act in 1878. Nothing had resulted from the recommendations of these bodies except the introduction of some dead-letter clauses into the Manchester, the Liverpool, the Birmingham, and the Birkenhead Acts. The Sewage Commission's third report contained a statement of the Commissioners that, in their opinion, a properly-equipped authority was essential; and they unhesitatingly recommended the creation of such an authority. This recommendation was made in 1903, and nothing had come of it. There was recently introduced into Parliament a somewhat crude measure called "The Water Supplies Protection Bill." It was referred to a Joint Select Committee, who took an exceedingly sensible view in relation to the great question of national water supply. They reported on the desirability of conserving in all reasonable ways the water supply of the country, and recommended the creation of an organization empowered "to inquire into the whole question of surface and underground water supplies from a comprehensive standpoint, to supervise the future allocation of supplies, and to serve as an authoritative adviser of Parliament in the consideration of particular schemes." This was such a reasonable proposal that he had no hesitation in predicting for it the oblivion to which such proposals were mostly consigned. The Committee went on to say that there was "an urgent need for a survey at once comprehensive and in detail of the water supplies and the water needs of the country, and for the adoption of measures for conserving the supply and disposing of it to the best advantage." This, again, seemed a dictate of common sense.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Friday, at the Offices, D'Olier Street, Dublin—Alderman W. F. COTTON, M.P., D.L., in the chair.

Mr. HOGAN, in the absence, through illness, of the Secretary and Manager (Mr. Francis T. Cotton), submitted the report of the Directors for the six months ended the 31st of December, which was noticed in the "JOURNAL" for the 21st ult. (p. 870).

The CHAIRMAN, moving the adoption of the report and accounts, said he might offer the proprietors his hearty congratulations upon the results of the half-year's working. No doubt it was within the recollection of most of them that about four-and-a-half years ago they expended something like £20,000 on repairing, re-sheeting, and renewing the large gasholder at the Barrow Street station. The Directors at that time resolved to form a suspense account, so that the amount might be written off half yearly; and he was happy to say that in the present revenue account would be found the last instalment due upon this work (£2474) written off. On several occasions during the past two-and-a-half years he had informed them that the Directors had decided on rebuilding their retort-houses and having them fitted with modern apparatus for producing gas on the most economic system. This work had been completed, and they were now beginning to feel the beneficial effects of the expenditure thus incurred, which amounted to £32,000. In this case also the Directors had resolved to form a suspense account, and write off the amount half yearly; and they had commenced with £4000 from the profits of the past half year. These retort-houses and works, with ordinary care and repairs, would last for the next forty years. He was gratified to be in a position to inform the proprietors that the Directors had all but completed the contracts for their coal supplies for the next year at moderate prices; being a reduction on those for last year. Turning to the accounts, he would deal first with the net amount received for gas and meter rents, which was £137,906, compared with £143,758 received during the corresponding period of 1909. Residuals also produced only £20,129, against £21,260; the principal reduction being on the sale of coke. However, he was happy to say that the market value of all residuals had improved during the last two or three months. Turning to the expenditure side of the account, coal cost £33,114, against £30,506. On the other hand, there was a large saving on oil, which cost only £19,439 compared with last year, when the expenditure under this head amounted to £27,822. Wages at works came to £3208, against £6848; repairs and maintenance of works and plant, to £3879, compared with £8847. These savings were consequent upon the economical working of the new retort-houses. When they came to deal with the net profit for the half year, they had £37,368, compared with £36,972, after writing off the last instalment of the gasholder and the £4000 off the expenses incurred on the new retort-houses. Notwithstanding all the prognostications made between thirty and forty years ago, or about the time of the introduction of electric lighting, that gas would become a thing of the past, he might inform the proprietors that, on the contrary, gas property was in a more prosperous condition to-day than ever it had been before. Gas was everywhere holding its own, and was finding uses which had not hitherto been thought of. In conclusion, he was glad to say that the prepayment system was developing in a most remarkable manner. During the past half year there had been put in 1874 new installations, in all cases fitted with cooker, brackets, and pendant. The total number of cookers and heating-stoves on Dec. 31, including those hired, was 42,423.

The DEPUTY-CHAIRMAN (Mr. John Murphy) seconded the motion, and it was carried.

The dividend recommended was then declared; and the proceedings closed with a vote of thanks to the Chairman, Directors, and officials of the Company—the services of the Engineer being specially mentioned.

BRITISH GAS LIGHT COMPANY, LIMITED.

A Steady Appreciation in the Business.

The Ordinary Half-Yearly Meeting of the Company was held last Wednesday, at the London Offices, No. 11, George Yard, Lombard Street, E.C.—Mr. J. HORSLEY PALMER in the chair.

The SECRETARY (Mr. A. W. Brookes) read the notice convening the meeting, and afterwards the Directors' report and, in compliance with the Act, the Norwich accounts. The former was as follows:—

The Directors submit the half-yearly accounts of the Company to Dec. 31 last, as examined and certified by the Auditors, who have also vouched for the correctness of the several investments held by the Company.

The available profit is £32,048, after deducting (omitting shillings and pence) the following sums: Income-tax, £2281; Hull debenture interest, £2118; Norwich debenture interest, £1779; Potteries debenture interest, £659; Trowbridge debenture interest, £164; and interest on debenture stock, £2260—£9263.

HULL.—The gas-rental shows a decrease of £565, as compared with that of the corresponding period of 1909; the price of gas having been reduced from 2s. to 1s. 10d. per 1000 cubic feet, from Oct. 1, 1910. Coke shows an increase of £1198; tar and tar distilling, an increase of £833; and ammoniacal liquor and sulphate of ammonia, an increase of £1190. Coals have cost 13s. 1d. per ton, as against 13s. Coke has realized 10s. 7d. per ton, as against 10s. 6d. The gas sold shows an increase of 24,321,290 cubic feet, equal to 3·80 per cent. The quantity supplied in bulk to the Corporation for the supply of the Old Town was 43,070,000 cubic feet, being 465,000 cubic feet less than the quantity supplied in the same period of 1909. The profit realized, after writing off the sum of £4885, part cost of the reconstruction of No. 4 gasholder, is £3615 less than the parliamentary interest. This sum will be taken from the reserve fund, leaving a balance of £45,759 to the credit of that account.

NORWICH.—The gas-rental shows an increase of £721 as compared with that of the corresponding period of 1909; the price of gas having been the same—viz., 3s. per 1000 cubic feet. Coke shows an increase of £327; and tar and ammoniacal liquor, an increase of £161. Coals have cost 16s. 3d. per ton, against 16s. 2d. Coke has realized 14s. 4d. per ton, against 14s. 6d. The gas sold shows an increase of 5,275,100 cubic feet, equal to 2 per cent. The profit realized, after writing off £1000 part cost of relief holder at the Palace Station, is £2311 in excess of the parliamentary interest.

POTTERIES.—The gas-rental shows an increase of £619 as compared with that of the corresponding period of 1909; the price of gas having been the same—viz., 2s. 6d. per 1000 cubic feet. Residual products show an increase of £508. Coals have cost 10s. 5d. per ton, being the same price as for the corresponding period of 1909. Coke has realized 8s. 7d. per ton, being also the same price as for 1909. The gas sold shows an increase of 6,092,451 cubic feet, equal to 3·45 per cent. The profit realized, after writing off £959, being part of the cost of removing and re-erecting a gasholder, is £203 less than the parliamentary interest. This sum will be taken from the reserve fund; leaving a balance of £1273 to the credit of that account.

TROWBRIDGE.—The gas-rental shows an increase of £43 as compared with that of the corresponding period of 1909; the price of gas having been the same—viz., 3s. per 1000 cubic feet, with discounts. Residual products show an increase of £48. Coals have cost 15s. 1cd. per ton, as against 16s. 3d. Coke has realized 11s. 9d. per ton, against 11s. 11d. The gas sold shows an increase of 278,400 cubic feet, equal to 0·74 per cent. The profit realized is £366 in excess of the parliamentary interest.

HOLYWELL.—The gas-rental shows a net decrease of £40; and residual products, a decrease of £10. The profit realized is £428.

The available profit added to the previous balance of profit and loss amounts to £96,540. From this sum, the Directors recommend a dividend at the rate of 10 per cent. per annum, with a bonus of 5s. per share, both less income-tax. The dividend and bonus, less tax, will amount to £28,838, and leave a balance of £67,702.

The CHAIRMAN, in moving the adoption of the report and accounts, said that he had a certain amount of interesting information to give the proprietors with regard to the work of the past half year, and also with reference to what had been done at individual stations. It was curious that their increase, though not what might be called excessive, corresponded very much with that of the great Metropolitan Companies and those in the immediate neighbourhood of London. The total increase in their business at all the stations was 3·18 per cent. The Gaslight and Coke Company had a 3 per cent. increase, the Tottenham and Edmonton Company 4½ per cent., and the Croydon Company 3·7 per cent. So they would see that their own Company ran very closely with those great works with which they were all cognizant in London. Thus while there had been a steady appreciation in the consumption of gas, it had not, during the half year which they had now under consideration, gone up with those leaps and bounds that they had experienced some years ago. There was, however, he was glad to be able to report, a further increase since the close of the year 1910. To turn now to the different stations of the Company, the proprietors would have noticed probably in the report of the Directors that the Company did not entirely make their parliamentary interest at Hull; but in this connection he would point out that they reduced the price of gas from 2s. to 1s. 10d. per 1000 cubic feet, and in addition to this wrote off the very large sum of £4885 from revenue for the reconstruction of an old holder put up in the early days of the Company, which more than accounted for the amount which they were taking from the reserve. Having such an ample reserve, it was only right that the sum stated in the report should be taken from it. They had also completed the office extension and new workshops at Hull which he had mentioned to the shareholders on several previous occasions. The business had increased there so largely that they had become much cramped for room. The new offices, which had been in use since Jan. 1, were a most serviceable addition to the Company's property in Hull; and, of course, they were able to do their work there with far greater ease than before. He thought all the Directors were of opinion that they could look forward with perfect confidence to the future as regarded the gas business. They had made contracts for their coals at a reduced price; and they had concluded contracts for oil, which now entered so largely into water-gas manufacture, also at a much lower figure. In fact, the price for oil was lower than any contract they had ever made. The Board had before them at the present moment the question of the extension of the works at Hull. They had almost reached the greatest output of gas that they could produce there; and if the business still continued to grow in the near future, they would be having to expend a considerable amount of capital on enlarging the works generally. That was to say, they would have to put up a new retort-house, gasholder, purifiers, and so on; and this was a subject which would occupy the attention of the Directors during the next half year. They were also hoping to have a very extensive and complete exhibition of gas apparatus in the principal hall at Hull. It was a large place, called the City Hall; they were unable to obtain permission to hold the exhibition there last year, because of other engagements. This year, however, they had secured the hall for October; and they believed they were going to have one of the most complete exhibitions of gas appliances that had ever been arranged in the North of England. With regard to Norwich, they had made their parliamentary interest, and had also got back a small amount—£2311—for unearned dividends in past years. They had now completed the new tank and holder at the Bishop's Bridge station. It was filled up during the last month, and would be of great assistance to their increasing business at Norwich. He could only repeat here that the oil and the coal would come to them at a lower price from July 1911; and therefore they would have every prospect of being able to earn their full interest at Norwich. The Board had been launching out a little with regard to the purchase of property. There was between the Palace station and the main road a block of property which the Directors had been for many years anxious to acquire; but it was only quite lately that an opportunity had presented itself of getting hold of it—certainly in a rather piecemeal fashion. They had, however, secured the great bulk of it; and they hoped in the future to be able to do away with a very narrow lane, terminating in a *cul de sac*, which would add to their property. Meanwhile, this land would belong to the parent Company, because it was not scheduled under their Norwich Acts; and he thought it would be a considerable and good asset for them. There was one unfortunate feature with reference to the Norwich station; and this was the competition of electricity under the Corporation. The Corporation had determined to light the city by electricity, and to take the work away from the Gas Company, who had lighted the streets for a great number of years. They had recently given the Company notice that they intended to

substitute electricity for gas in a third of the city, notwithstanding the most liberal offers that had been made to them; and if the Council were satisfied with this, they would light one-third more of the streets by electricity in 1912, and the remainder in 1913. He did not think he could say much about this, because, when a corporation had their own electricity works, and determined to light their own streets, even the best-managed gas company could hardly prevent them from doing so. The Directors had made up their minds that the time had arrived when they could offer another reduction in the price of gas; and this had nothing whatever to do with the question of electricity. It had only to do with the working of the Gas Company. They had earned their parliamentary interest, *plus* a moderate surplus; and as far as they could see, they would be able to do the same at any rate in the immediate future. Therefore the Board took advantage of this fact to give notice to the consumers in Norwich that they intended to reduce the price of gas from 3s. to 2s. 10d. per 1000 cubic feet from the March quarter. He believed that this would have a good effect on their business in Norwich. In addition to this, there was a matter which was not always in the public eye, and for which, to his mind, gas companies did not obtain sufficient credit, and that was the substantial rebates which they were in the habit of making to large consumers and to those who used gas for manufacturing purposes. Their own Company gave rebates which, to large consumers at Norwich, brought the price of gas down to 1s. 9d. per 1000 cubic feet for manufacturing purposes. He desired to mention this, because, as he had said before, he did not think gas companies usually received full credit for these rebates. In connection with their Potteries Station, there was little to explain. He was glad to say that business in this district was improving, and the Company were going on steadily there. They had been asked to make extensions of their mains to various outside places—Milton, Norton-in-the-Moors, and Newchapel. These were all places where, though the business might not be very large at the present moment, the prospects were sufficiently attractive for the Company to lay the necessary mains. As to Trowbridge, he had lately visited this station with the Secretary, because the Urban District Council had expressed some dissatisfaction with regard to the public lighting. They paid a surprise visit to the town; and he must say they did not find anything that could cause dissatisfaction with the public lighting. They walked all over the place, and saw that the lighting of the streets was exceedingly well done. He might say there was some talk about an Electric Light Company; but that they would undertake an installation in a small place like Trowbridge, he could hardly think possible—except with an idea of selling it at some future time to the Council. At Holywell, their smallest station, there had been the purchase of a house for the manager. It was going to be sold; and there were very few houses in a small town like Holywell suitable for a manager to live in. Therefore the Board thought they were acting in the interests of the Company in acquiring this one. This was really all he had to say to the shareholders about the individual stations. Those of them who were interested in gas matters would know that the Standard Burner Bills received the Royal Assent on Nov. 28 last. The Company were interested in the passing of them, and contributed towards the cost. This brought him to what perhaps was the most important point of all that he had to mention—namely, the dividend and bonus. They would remember he informed them on the last occasion that it was the proposal of the Board, following the lead of a great many other large companies, to pay dividend and bonus with income-tax deducted; but he also intimated that the Directors hoped to be in a position to pay shareholders not less than they then received—£1 2s. 6d., free of income-tax. No doubt, the proprietors were gratified to learn that they were to receive £1 5s., which, with income-tax deducted, really meant an increase of 1s. 0½d. for every share. That was to say, the amount would now be £1 3s. 6½d. per share, against £1 2s. 6d. before; or, if they preferred to take it in percentages, they would receive 11¾ per cent., as against 11¼ per cent. He hoped this would be satisfactory both to those shareholders who were present at the meeting and those who were not. Probably some of them lately read in the papers about a proposed Publicity Committee. In most foreign countries, to interest people in gas there was such a body as a Publicity Committee, who organized advertisements and every conceivable method of letting persons know how to use gas, and so on. Though in this country this had been done very largely by the companies themselves in the particular towns they supplied, it had been thought right to organize a general Publicity Committee; and as their Company, though an old one, were always ready to advance with the times, the Directors heartily fell in with the proposal, and agreed to co-operate if fifty companies would join them. He understood there was to be a large meeting, at which their Secretary would represent the Company, to consider the first proposals and what should be done to organize the Committee. He was quite certain such a Committee was required in this country.

Mr. Frederick Wilkin seconded the motion; and it was carried unanimously.

Proposed by the Chairman, and seconded by Major-General W. T. Corrie, a dividend was declared at the rate of 20s. per share and a bonus of 5s. per share, both less income-tax.

Mr. Kenneth R. Mackay, in proposing a hearty vote of thanks to the Directors, remarked that it was most gratifying in these hard times to hear of a company paying an increased dividend. In order that such a result might be attained, it was essential to have a good Board of Directors.

The proposition was seconded by Mr. Bernard F. Harris, and cordially agreed to.

The Chairman having briefly acknowledged the compliment on behalf of himself and his colleagues,

Mr. Corbet Woodall said that, though the resolution just carried was usually the last, he would not be defrauded of his privilege of moving a vote of thanks to the officers. The story the Chairman had just told them had been one of serious and successful work at all the stations; and he (Mr. Woodall) was glad to say that, so far as the Board knew—and they were fairly intimately acquainted with them—they were all in good order, and being carried on in a manner which was quite up to the most modern knowledge in the gas industry. The work of an engineer at their stations was not by any means confined within the walls of his factory. They had heard of the competition which had to be faced, and knew how necessary it was to live on good terms with the people in the different towns. The Chairman had specially referred to the competition of electricity in connection with the public lighting of Norwich. Well, this kind of thing was being met with all over the country; but he had no doubt whatever as to the ultimate issue—that if efficiency for cost was to be the final basis on which the matter would be settled, gas would come out on top. He need hardly tell them how completely satisfactorily the Company's work was done in London. The Secretary was always well informed of what was going on both there and at the various stations, and was at all times ready to help the Board in any way they required.

Mr. L. R. Wilkinson seconded the proposition, which was unanimously carried, and acknowledged by the Secretary.

OTTOMAN GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held on Tuesday last, at the London Offices, No. 9, Queen Street Place, E.C., under the chairmanship of Mr. Stephenson R. Clarke.

The Secretary (Mr. Thomas Guyatt) read the notice convening the meeting and the certificate of the Auditors; and the report (which was noticed in the "Journal" for the 21st ult., p. 868) and the statement of accounts were taken as read.

The Chairman, on rising, remarked that Colonel Daniell, who had not yet been permitted by his medical advisers to return from the South of France, had asked him to convey to the shareholders his regrets at not being present at the meeting. The condition of the Company's affairs at Smyrna was, on the whole, satisfactory, though he regretted to say that the Turkish Government had been again pressing the Company for the payment of the Emlack Tax, which it appeared to the Directors and their advisers (who were most competent men) the Company were not liable to pay. During the past twenty years, this question had repeatedly cropped up, and had always been decided in favour of the Company. The Directors hoped that justice might again prevail, and that the Company's undoubted rights to be free from this tax would be respected. The rental for gas supplied during the past half year had reached the total of £21,956, against £19,593 for the corresponding half of the previous year. They had also been able to record an increase of £1240 in the sale of products. This increase in business had necessitated the use of 822 tons of coal extra; but the Board were pleased to be able to report that the total cost of coal was only £6777, against £6905—being £128 less than in the corresponding period of 1909—in spite of the additional quantity carbonized. The Company had been able to complete the conversion of the street-lamps from the old flat-flame burners to the modern incandescent system. Considerable additions had been made to the reserve fund and amortization account; and £1500 had been written off works and plant. He was pleased to say that the figures received for the first two months of the present year showed a still further increase of business; and as some years had now elapsed since any large additions were made to the manufacturing plant or the storage accommodation, the Directors found that the business was approaching the margin of safety. They had therefore ordered for delivery this year a new holder of 520,000 cubic feet capacity; and during the year following they would probably undertake the construction of an additional retort-house. He moved that the report and accounts be adopted.

Mr. H. Ward Andrews seconded the motion; and it was, without discussion, carried unanimously.

The Chairman proposed the payment of a dividend for the half year to Dec. 31 at the rate of 7 per cent. per annum, less income-tax, on the preference shares, and of 8 per cent. per annum, tax free, on the ordinary shares.

Mr. Strachan C. Clarke seconded this; and it was agreed to.

The retiring Directors (Mr. Stephenson R. Clarke and Mr. Strachan C. Clarke) were next re-elected, on the proposition of Mr. Andrews, seconded by Mr. A. M. Paddon; and the Auditors (Mr. T. H. Cooke and Mr. A. W. Cooper) were also re-appointed, on the motion of Mr. T. P. Fisher, seconded by Mr. W. H. Daun.

The Chairman proposed a vote of thanks to the Engineer and Manager (Mr. John Gandon) and the staff at Smyrna and to the Secretary and the staff in London. He remarked that they all knew Mr. Guyatt, and had many opportunities of judging how unceasingly he watched over the Company, and how ungrudging he was of his time and his best efforts. They did not so often have the pleasure of seeing their Engineer; but he thought the accounts which the Board had that day presented afforded very eloquent testimony of his services to the Company; and he was sure that Mr. Gandon well deserved their hearty thanks.

Mr. Paddon, in seconding, remarked that the excellence of the accounts represented the degree of merit of their officers which they had to acknowledge. He saw no reason to doubt that the progress now shown would be maintained.

The resolution was carried unanimously; and Mr. Guyatt briefly returned thanks.

Mr. F. C. Collingwood proposed a vote of thanks to the Chairman and Directors for the able way in which the affairs of the Company had been managed, which had resulted in their being able to place such a gratifying report before the shareholders. It was pleasing to the proprietors to see the Company in so flourishing a state.

Mr. W. T. Clarke seconded the vote, which was heartily accorded.

The Chairman's acknowledgment brought the brief proceedings to a close.

Ryde Water Supply.—On the recommendation of the Water Committee, the Ryde Corporation have agreed to extend the appointment of Mr. William Matthews as Consulting Engineer, for the carrying out of the remainder of his scheme of water supply, and have requested him to prepare plans, specifications, and estimates of the pumping machinery and appliances.

GAS SUPPLY IN SHANGHAI.

In opening their report presented at the annual general meeting of the Shanghai Gas Company on the 23rd ult., the Directors congratulated the shareholders on the satisfactory result of the working in the twelve months ended the 31st of December last. The profit amounted to 279,965 taels; being an increase of 30,083 taels compared with the preceding year. The net profit was 250,557 taels, or 18,497 taels more than before. The balance at the credit of the profit and loss account, after crediting the account with 4709 taels brought forward, and deducting 3961 taels bonus paid to the foreign staff and the interim dividend (72,000 taels), was 179,305 taels, which the Directors recommended should be appropriated as follows: Final dividend (making 13 per cent. for the year), 84,000 taels; and allowance for depreciation, 84,189 taels—leaving 11,116 taels to be carried forward. The gas sold was divided as follows: Private consumption, 504,764,000 cubic feet—an increase of 31,999,100 cubic feet; public lighting, 9,377,300 cubic feet. There was a satisfactory increase in the gas used for power.

Appended to the Directors' report was one made by the Engineer (Mr. F. W. Potter) which furnished the following particulars: Coal carbonized, 46,941 tons; gas made, 537,099,900 cubic feet, or 11,440 cubic feet per ton; gas sold, 514,141,300 cubic feet; used at works, unaccounted for, and in stock, 22,958,600 cubic feet; unaccounted for in distribution, 2·87 per cent.; length of mains laid during the year, 11,398 yards; approximate total length of mains, 93·26 miles.

GAS SUPPLY IN NEW ZEALAND.

Progress of the Auckland and Wellington Gas Companies.

Since the reports of the Colonial gas undertakings noticed a fortnight ago came to hand, two others have reached us from New Zealand, and may be briefly noticed.

At the annual meeting of the Auckland Gas Company, Limited, the Directors reported that the profits amounted to £44,021; and they recommended a dividend for the six months ended Dec. 31 of 1s. 6d. per share on the fully-paid £1 shares, and a proportionate dividend on the contributing shares on which 10s. has been paid. These dividends would amount to £19,485. This added to the total of the interim dividend paid in July, £18,283, would come to £37,768, and leave a surplus of £6253. In moving the adoption of the report, the Chairman (Mr. T. Peacock) stated that the number of consumers had increased in the year by 1742; making a total of 19,878. The quantity of gas sold was 551,770,000 cubic feet; being 50,844,000 cubic feet, or 10·15 per cent., more than in 1909. Upwards of 29 miles of mains had been laid during the year; making the total length 284½ miles. This showed in a decided manner that the Company, through the Board, were fully alive to their duty of providing efficient lighting and heating by gas to the rapidly increasing population of the city and suburbs, wherever there was a prospect of reasonable return. With regard to the works, a new and larger exhauster-house was in course of erection, and the coal-store conveyor had been extended. But the principal work undertaken was the building of a larger gasholder, which would have a capacity of 2,300,000 cubic feet, and would provide a good reserve of storage. The report was adopted.

In the past year, there was again a very satisfactory increase in the quantity of gas sold by the Wellington Gas Company, Limited. There were 12 miles of new mains laid, and 850 new services fixed. A new gasholder at Miramar has been brought into use; and the Directors have placed orders for a large portion of the plant required for the first instalment of the new works. The existing plant was maintained in an efficient condition; and a sum of £5194 was expended out of revenue on extensions, repairs, &c., and £3354 written off for depreciation. The accounts presented showed that the sale of gas, residual products, goods, &c., brought in a revenue of £89,213; and the manufacture and distribution of gas, repairs, &c., cost £65,862. The balance on the profit and loss account at the end of the year was £24,077; and the Directors recommended the payment of a final dividend at the rate of 5 per cent. per annum—an interim dividend at this rate having been already paid for the six months ended June 30.

LANCASTER CORPORATION GAS UNDERTAKING.

The Past Year's Working.

At the Meeting of the Lancaster Town Council last Wednesday, Alderman Helme, M.P., in moving the adoption of the minutes of the Gas Committee, said the result of the year's work was again more successful than had been anticipated. They had secured £230 more for gas; and they might have done even better if the adoption of incandescent lighting had not allowed consumers to have more light for a smaller quantity of gas than would have been the case if they had kept the old burners. Early closing in the town had also made a difference in the amount of gas consumed in business premises. In regard to expenditure, they were able to obtain coal supplies at lower cost than they had anticipated. There was also a saving on maintenance of works; the total expenditure being £25,166, against an estimate of £25,226. The balance estimated was £2978; and, after providing £1700 in free gas for the lighting of the town, the actual balance was £4142. Out of this amount, £2000 was put aside as a contribution to the rates, leaving £2142. The Gas Committee were always at the service of the Council; but they had hoped they might have had the consent of the Finance Committee to offer £1000 of this surplus to the Lighting Committee for the substitution of incandescent lamps throughout the town. They also desired to reduce the price to consumers by increasing the quantity of gas provided for 1d. through the prepayment meters from 33 to 36 cubic feet. Such a reduction would cost 2¾d. per 1000 feet; bringing the price down to 2s. 3d. They had hoped also to be able to reduce the price to consumers by ordinary meters. For the moment, the exigencies of the situation financially were such that they were not able to realize these hopes. The net profit was £5842; and of this sum £1700 was used for lighting the streets, and £2000 as estimated for the relief of the rates. But the Finance Committee now desired a further sum of £1600 in order to prevent any increase in the rates. With regard to the estimates for next year, the Finance Committee desired to appropriate £1000 out of next year's profits in order to pay over this sum to the credit of the Tramway depreciation. This, he feared, would prevent them reducing the price of gas or securing the better lighting of the town. The prosperous position of the gas undertaking was owing to the continued care and assiduity of the Manager (Mr. Charles Armitage, Assoc.M.Inst.C.E.); and they hoped next year it would be even more prosperous. The minutes were confirmed.

SUNDAY GAS-TESTING AT LEYTONSTONE.

At the Meeting of the West Ham Corporation last Tuesday, the Highways Committee reported that they had been in communication with the Gaslight and Coke Company in regard to the result of a test made at Leytonstone on Sunday the 12th of February. The Secretary of the Company (Mr. H. Rayner) had written to the effect that the letter received from the Council had been the subject of very careful investigation, and as a result the Chief Engineer (Mr. T. Goulden) reported that the illuminating power of the gas sent out from the Company's Stratford works on the day named was fully up to the standard of that supplied on any other day about that date. It appeared, however, that the test in question was (so far as he was aware) the first official test made at the Leytonstone testing-place on a Sunday, and that no notice of an intention to test had been given. Consequently there was no artificial heat in the testing-room; and instead of the normal temperature of about 60° Fahr., at which tests were usually conducted, the thermometer had fallen to about 47° Fahr. This would be quite sufficient to account for the low return of illuminating power. He said that if the gas-tester would in future notify Mr. R. Birkett, the Engineer at the Company's Stratford works, by the previous evening, of any intention to test on a Sunday, the heating apparatus would be put into operation, with the result, it was hoped, that no such low test as the one in question would again be recorded. In the report of the Corporation's Gas Examiner (Mr. W. C. Young), on this explanation, he said the testing was the first one made at the present office; but many previous Sunday testings had been carried out at the former testing-stations of the West Ham Gas Company. The temperature of the room at the time of testings was 49° Fahr., which was very low, and might have been the cause of the low result. Mr. Young added: "I have never yet been asked by the Company to give notice of my intention to test; but I believe they can demand notice on the day previous before noon. I do not think there is any necessity for notice in the case of Sunday testings; and there is no reason that I am aware of why the testing-room should not always be kept at the proper temperature, as in all the other official testing-places of the Company." No further action is to be taken on the matter.

LIGHTING OF RAILWAY CARRIAGES.

Major Pringle's Report on the Hawes Junction Accident.

It will be in the recollection of readers of the "JOURNAL" that, owing to the error of a signalman, a fatal collision occurred on the 24th of December last between an express passenger train and two light engines near Hawes Junction on the Midland Railway; the result being the loss of twelve lives, and more or less serious injury to about thirty people. As the deaths were caused by fire from the wrecked coaches, and as, with the exception of the two sleeping cars, which were electrically lit, the train was lighted by compressed oil-gas, the relative dangers of the two illuminants formed a special feature of the inquiry into the circumstances of the accident conducted by Major Pringle, R.E., on behalf of the Board of Trade. His report was issued last Thursday; and we extract from it the portion dealing with this subject. It may be explained that the two coaches destroyed were No. 237 and No. 225; and they are thus referred to in the report. The following are Major Pringle's remarks.

The evidence, as might be expected in such distressing circumstances, is at variance upon some points; but the fact is established that the fire originated in an escape of gas from some of the cylinders carried under the first two coaches. There were two cylinders under No. 237 (the first), and three under No. 225 (the second); and it has been estimated that at the time of the collision the pressure of gas in these cylinders was from 76 to 80 lbs. The steel framework of the second coach, in forcing its way under the frame of the first, drove its rear bogie close up to the front bogie. In this movement the rear bogie must have come into contact with the two gas-cylinders, which broke away at the flange-plate from the ¼-inch high-pressure pipe. The end of each of the cylinders was bulged in and perforated. From experiments subsequently made with these two cylinders, it appears that the time occupied by the gas to escape through the perforations and the ¼-inch diameter hole, with an initial pressure of 80 lbs., was 1¾ and 2 minutes respectively. The three cylinders under No. 225 were not punctured or perforated; but the high-pressure connecting-pipe was found sheared off. Experiments show that all the gas, starting with an initial pressure of 76 lbs., would escape from these cylinders through the ¼-inch broken pipe in about eight minutes. There is no proof that the high-pressure connecting-pipes under No. 225 were broken by the collision; and it is possible that the breakages were occasioned subsequently, in lifting and clearing the wreckage. In the case of the two cylinders under No. 237, it is probable, judging from

the bulged-in ends, that the perforations were caused at the time of the collision, and the high-pressure connection sheared at the same moment. Gas must then have escaped very freely from these two cylinders. There is no evidence of incandescent coal or ash having been seen on the permanent way, which might have lighted this gas. From experiment also it seems improbable that flashing-back through broken pipe lengths would have caused ignition. But there can be no doubt that, from the grinding together of the steel underframes and the bogies, the passage of the wheels over the broken rails and ballast, and the effect of the brake-blocks upon the wheels, much flashing and sparking went on—amply sufficient to account for the ignition of the escaping gas. There cannot, I think, have been any violent explosion, as the escape was into the open air, and a strong wind was blowing. But one of the witnesses speaks of having seen in his cottage, 200 yards distant, a bright flash, which may have been caused by a large quantity of gas igniting. This flare of gas, judging from the results of experiments, is not likely to have lasted more than two or three minutes, if the cylinders were perforated at the time of the accident; but it may easily have engendered sufficient heat to ignite the inflammable woodwork above the steel framing. These two cylinders lay under the brake compartment of No. 237, which, I am informed by the Company, was empty at the time of the accident, though one or two witnesses speak of noticing what appeared to be boxes, hampers, &c., in this compartment.

A number of witnesses—platelayer Field, fireman Jenkins, Eng.-Lieut. M'Ghie, R.N.—record that they actually saw gas burning; but it is difficult to locate the positions of these jets or flames of gas, except that they were somewhere under the frames of the first two carriages. Lieut. M'Ghie saw two such jets, which he describes as having a length of 3 or 4 feet. One of these jets he was able to extinguish, by crawling under the coach, with his gloved hand. The other, owing to the great heat, he was unable to approach. I can only suppose that these jets issued from the low-pressure connections of the three cylinders under the second coach, which were found unperforated. Otherwise, the jets, even after burning freely for some minutes, would have been even larger than described. From his statement, which is in a general manner supported by the evidence of Field and Jenkins, the fire which he was unable to extinguish must have originated in the gas from the cylinders under the second carriage, Its position at the outset must have been under the centre of the frame of the carriage, which would be towards the rear end of the crushed compartments.

Major Pringle deals with the evidence given at the inquiry, and then makes certain recommendations. In connection with the after-effects of the accident, he offers the following observations on

The Safest Illuminant for Railway Carriages.

It cannot be denied that compressed oil gas stored in the cylinders under the first two coaches was the origin of the fire in this case. Nor can it be denied that there is greater liability to fire, in a railway accident of this description, when gas is used as the illuminant, than with electric light; for it is a simple matter to prevent danger from short-circuiting of electric wires by the proper provision and arrangement of fuzes. But the elimination of gas as the source of light would not preclude all danger from fire. There remains the risk from the contents of the engine fire-box, and from the employment of coal, coke, or gas in cooking-ranges and stoves on restaurant cars. Instances of fires so originated can readily be quoted—*e.g.*, at Grantham, and possibly at Cudworth. In fact, this is actually the first occasion when it can be proved, beyond question of doubt, that fire was occasioned by burning gas. It has to be remembered also that gas has been in use for lighting purposes for a very long period; and that during the whole of that time—in fact, since the year 1868—there is no case of fire destroying either the lives or bodies of passengers in a railway accident.

Gas, with the latest improvements in the way of incandescent mantles, &c., has also many practical advantages over electricity as a source of illumination. It requires no expert staff, is nearly as easily controlled, is more economical to instal and maintain, and is less liable to failure as an illuminant. It is only reasonable, therefore, first to consider, before entirely condemning it, whether it is possible to safeguard the use of gas as an illuminant, by the adoption of any improvement in appliances which may minimize the risk of fire.

The following suggestions, among others, have been made and deserve consideration.

(*a*) The provision of a valve, which, when the rush of gas exceeds that due to a certain pressure, shall automatically close and prevent the further issue of gas. Possibly the best place for such a valve would be inside a cylinder. If it be possible to devise a reliable and practical valve of this description, there can be no doubt that additional security from fire would result.

(*b*) The strengthening of the ends of the cylinders themselves, so that they shall be less liable to damage or perforation as the result of a blow.

(*c*) A decrease in the size of the diameter of the cylinders, and improvements in their housing and protection, as well as of the gas-mains, so that they may be less likely to be struck and injured.

(*d*) An alteration in the position of the cylinders themselves above the roof instead of under the framing. The higher position has already been adopted in a few cases of some gas-lighted trains on other railway systems. The possibility of this alteration depends firstly upon the loading gauge, and secondly upon the strength of the roof to carry the additional load. There may also be difficulties to overcome in connection with weather. Provided that carriages preserve their proper upright position in an accident, the roof may possibly be the safer of the two alternatives; there is certainly room for doubt on this point.

(*e*) The provision of some incombustible material—*e.g.*, uralite—above or below the cylinders, according to the position adopted, of sufficient area and thickness to render firing of the woodwork from burning gas less probable.

No doubt improvements in some of the directions above suggested will minimize the risk of fire when gas lighting is used. But, even with every such possible precaution, it will remain true that electric lighting will still be the safer method. On grounds of safety, therefore, I still hold that electricity is the more desirable means of illumination for passenger trains, and, as such, should be adopted wherever possible. In the case of long-distance and express trains, it is more particularly to be recommended. In the meantime—for, of necessity, a long period must elapse during which gas will still be very largely used as an illuminant—a good deal can be done in the directions above suggested to reduce the liability to fire from its use.

LECTURES ON WATER HEATING BY GAS.

At the Mitcham Gas-Works last Tuesday, and at another large gas-works next day, lectures were delivered by Mr. Frederick Dye, M.R.I. (who has charge of Messrs. John Wright and Co.'s Hot-Water Department), to a full audience of officials of the two Gas Companies. The object of the lectures was not so much to deal with the subject of gas-boilers as to give comprehensive and practically useful information on hot-water work—the hot-water apparatus as erected in residences and other buildings where a good demand for hot water exists. The lecturer and the firm he represents realize that at present many gas inspectors are wishful to have the benefit of their wide experience in dealing with hot-water installations, and that, as the heating of water by gas has a great future before it, information of the best kind, condensed as far as can be, is needed in the shortest possible time. This the lectures aimed at, and should succeed in accomplishing. According to what appears to be Mr. Dye's practice, a "paper" was provided—a small but practical book on hot-water systems, well illustrated; but instead of reading it, the lecturer discoursed upon the important details from notes. This went to increase the scope of the subject. For instance, while the booklet illustrated and briefly stated that pipes are connected at certain different points in boilers, the verbal description gave the reason why this was done, and what happens if it is not done It is a plan that keeps an audience interested.

Commencing with an account of what causes the circulation of water, the lecturer went through all the different systems, from the oldest to the newest, giving a useful descriptive account in every case, and ending with the best means of connecting-up gas-boilers and judging what power of boiler to use. Hot-water failures, points to be observed when inspecting a residence for a gas-boiler, and means of computing what the boiler has to do, were all dealt with. Tables of proportions of parts of different hot-water systems were given, their value lying in the fact that by their use the inspector can either erect an apparatus correct to meet any requirement, or judge the correctness of any existing apparatus. The thermostat came in for a good share of attention, in view of its being so important an appliance in relation to the popular use of gas for heating water. The lecturer expressed the conviction that it is the one thing that could make all the difference between waste and economy, failure and success; but he pointed out that to do this the thermostat must be of a reliable kind. The lecture closed with some information upon warming rooms by radiators served by the firm's "Garajo" heating-boiler.

High-Pressure Gas Lighting for a Workhouse.

Subject to sanction being obtained from the Local Government Board, the Stockport Poor Law Guardians have decided to enter into a contract with the Selas Lighting Company, Limited, of Manchester, for an installation in the workhouse of the Company's system of high-pressure gas-lighting, at a cost of £355, "subject to the condition that the Company guarantee that, in the event of the consumption of gas exceeding 1092 cubic feet per hour (as against the present consumption of 3593 cubic feet), they will take back the whole of the apparatus and accessories without compensation." At the last meeting of the Board of Guardians, a letter was read from the Company stating that a 1 H.P. motor would be ample to drive their installation; and it was also reported that the cost of such a motor from the Stockport Corporation would be 9s. per quarter, and that the expense of current would be just under 1d. per hour. In the course of the discussion, Mr. E. Barton, Chairman of the Gas Supply Committee of the Board, said their gas bill at the present time was something like £500 a year, and by the system they were adopting there would be 50 per cent. less consumption of gas, and the cost would be paid off in two years. In answer to a question, he said the guarantee of the Company was restricted to one year.

Fatal Accident at Ipswich.

While engaged in connection with the unloading of a cargo of coal for the Ipswich Gas Company, a labourer named Bumstead (who was engaged in trimming the coal in the hold of the vessel) got caught in the jaws of the grab, which closed upon him together with the coal that the grab was taking up. Directly the accident was noticed, the grab was stopped; but when released, the unfortunate man was dead. At the inquest, Mr. W. Alexander, a Director of the Company, said the Board deeply sympathized with the widow and children, who would receive every consideration at their hands. Mr. Frank Prentice, the Company's Works Manager, said the grab had been working for about ten years; and there had been no previous accident. Deceased could not have been carried by coal into the grab after it had landed on the coal; nor did he think the landing caused a slide of coal. His idea was that the coal slipped under the man's weight, and he fell, after which the grab descended on him. Mr. W. Harrison, Superintendent, said he did not expect a man to go down into the hold so quickly; only about 8 or 9 feet of coal having been removed. The men usually went down when about 14 feet had been taken out. He could not tell why deceased (who was a thoroughly experienced man) went down when he did. It was for the men to decide when they were to go down; and it was quite a voluntary action on the part of deceased. The occurrence took place in the early morning; and one witness expressed the opinion that Bumstead descended to the hold in order to get into the warm. The Jury returned a verdict of "Accidental death," and attached no blame to anyone.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

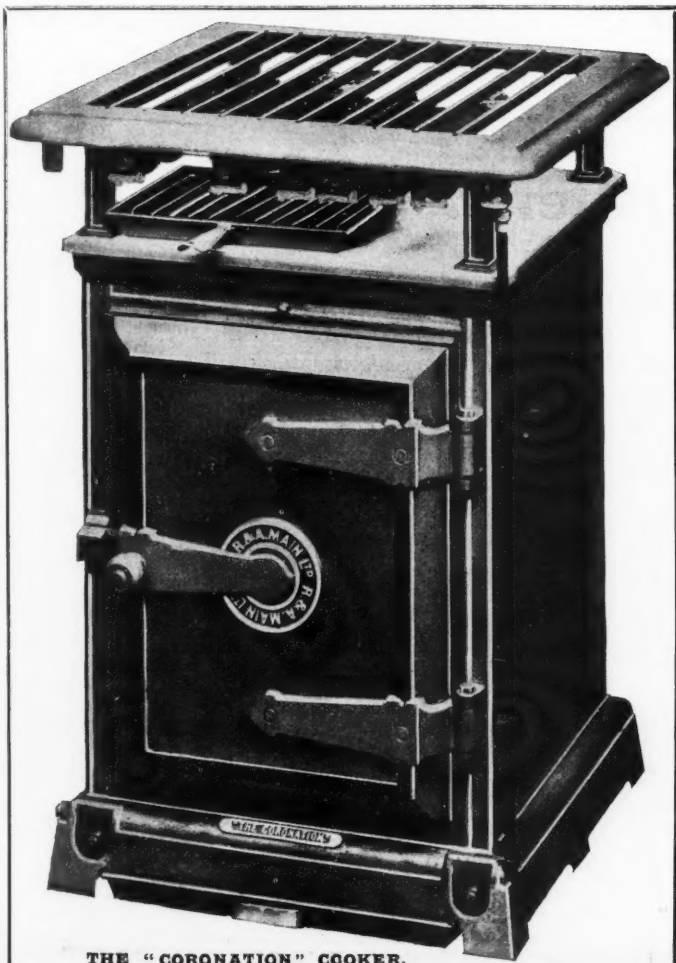
Saturday.

At last, after a more than usually long period of incubation and negotiation, the Corporation of Kirkcaldy are, by virtue of the decision of Lord Shaw of Dunfermline, the owners of the gas undertaking in their midst. There surely must be a feeling in the minds of most who take an interest in such questions that, in the matter of a contested valuation, the result is not commensurate with the labour involved in the process. The active proceedings of the arbitration occupied the special tribunal for ten separate days. The result of all this expenditure of time and labour has been the obtaining of a finding, which has all the force of law, the effect of which is to establish that the Company asked for their undertaking nearly a third more than it is worth, and that the Corporation offered not very much more than half what it is worth. In the same spirit in which I wrote regarding the transfer at Dunfermline, I state my belief now that a divergence of opinion so great as between £224,000 and £84,000 is unreasonable; and that when account is taken of the experience of other corporations who have obtained transfers, so large a difference should not be possible. The decision is, in effect, a doubling of the Company's capital, which was spoken to as amounting to £65,000, *plus* 10 per cent. for compulsory sale. It will, in all probability, be found that the award is a very fair one for the Corporation, who have obtained a gas undertaking on the basis of a price equal to £1100 per million cubic feet of gas sold, which is, by comparison, a more reasonable figure for the purchasers than were the prices at Falkirk or Dunfermline—the two most recent previous transfers in Scotland: the price in the case of Falkirk having been at the rate of £1600, and in the case of Dunfermline of £1500, per million cubic feet sold. It may also be said that the award is not an unfair one for the Company. Their maintainable profit was stated by themselves to be £6500; and the dividend paid has for years been 7½ per cent. It will be found that 7½ per cent. upon £65,000 is not very far off from 3¾ per cent. upon £137,000. When looked at in this light, it does seem surprising that it should have taken a bevy of learned gentlemen ten days to have arrived at such a simple result. Clearly the method of fixing prices or valuations by arbitration is too cumbrous, and therefore too costly, a process to be adopted, unless in the most clamant or necessitous of cases. It is announced—unauthoritatively, of course—that the costs of this arbitration have amounted to between £8000 and £10,000, which is about 7 per cent. on the price allowed. In ordinary business, 7 per cent. would be a prohibitive commission to pay. The probability is that it will be found to be so in the case of gas transfers, and that the Kirkcaldy transfer will be the last disputed one in Scotland. It is not difficult to imagine that, when parties come into negotiation regarding a gas transfer, and arbitration is proposed, the intending purchaser will be found crying off, and saying that he would be willing to pay the value of the undertaking and 10 per cent. for compulsory sale, but not to add 7 per cent. for the cost of getting the undertaking; in which case, if there were to be any benefit in the procuring of a transfer, that benefit would be lost, not on the merits, but on account of a detail. The price in Kirkcaldy will work out at £137,150 award, less £11,049 cash in hand, &c., and less about £8000 as the value of heritable properties other than the gas-works—leaving about £118,000, to which has to be added (say) £9000 of expenses, or a total sum to pay by the Corporation of £127,000. This is considerably more than it is understood the Corporation expected to have to pay; and there is every likelihood that representations against Lord Shaw's proposed findings will be made, and particularly upon the question of the Company being allowed to retain the £11,049. While it is almost a certainty that the award will be challenged, there is very little chance of its being upset, or even altered to any degree; and so it may be concluded that the price to be paid will be as announced.

There is a measure passing through Parliament at the present time relating to the management of the harbour at Dundee. The harbour is owned and managed by a Trust, who conduct their business under Statute; and some of the situations resulting from strict statutory requirement have been the reverse of satisfactory. Thus, coal for and coke from the gas-works were at one time found to be difficult to get from and to the harbour, notwithstanding that only a roadway and a railway line separate the gas-works from the harbour. In connection with the measure now being considered, an arrangement has been come to between the Trust and the Railway Companies, under which the harbour railway lines are to continue to be the property of the Harbour Trust; but they are to be available at a yearly rent for the Railway Companies' use, and the latter are to be bound to carry over the rails all traffic which may be tendered to them. This will give the Gas Commissioners a service of right, which for some years they have been enjoying, in the carriage of coke, by favour of the Harbour Trust.

Under the constitution of the Montrose Gaslight Company a co-partnery is created, which exists for a period of twenty-one years. The fourth of these terms expires on 23rd inst.; and on Wednesday a general meeting of the shareholders was held, at which, on the motion of Mr. A. Muirdeen, the Chairman of Directors, it was unanimously agreed to extend the co-partnery for another period of twenty-one years.

A scheme for the extension of the burgh of Falkirk is at present being promoted, regarding which there is a good deal of adverse criticism, on account of the additioual burdens which are likely to be laid upon the community. To-day the "Falkirk Herald" publishes what are described as opinions which have been gathered from various sources regarding the scheme. Upon the gas undertaking it is stated that "it is certainly very desirable that the interests of it should be safeguarded; but people are amused at the idea that these interests are supposed to be in any way endangered. It is recognized that Larbert and Stenhousemuir have the power to hire off from Falkirk, and start a gas-works of their own; but no one, except he be a town councillor, imagines that they would be so foolhardy. It is well known that, in connection with gas undertakings, the experience is that the larger the output the cheaper the gas becomes. . . . There has been a represen-



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tation with respect to the gas-works—namely, that though a wide area gets the benefit of them, the whole responsibility would fall on Falkirk were any disaster to happen in connection with their gas-works. Is there not, it is asked, insurance against that; and if there be not, why not? In any case, it is further asked: Were there additional financial obligations to face which consumers outside the burgh escape, while those within had to reckon with them? Questions of this kind are being freely asked regarding this matter, which indicates that dissatisfaction prevails in the community with arguments that have been put forth on the other side."

CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 66.]

LIVERPOOL, *April* 1.

Sulphate of Ammonia.

During the past week, there has been a paucity of new orders both for export and home consumption, and the market has continued to droop; the demand for the United Kingdom being especially poor for the time of the year. Makers have, therefore, only been able to dispose of current production at declining prices, and the closing values are £13 17s. 6d. per ton f.o.b. Hull, £13 18s. 9d. per ton f.o.b. Liverpool, and £14 1s. 3d. per ton f.o.b. Leith. Manufacturers have reduced their quotation for July-December delivery to £13 10s. per ton f.o.b. east or west coast ports, but cannot find buyers thereat; while dealers are reported to be offering at rather less money without meeting with much success.

Nitrate of Soda.

The position of this article continues without change, and the prices on spot remain 9s. 7½d. and 9s. 10½d. per cwt. for ordinary and refined quality respectively.

LONDON, *April* 3.

Tar Products.

The markets for tar products have been decidedly quiet during the past week. There is very little fresh business doing in pitch. Creosote is quiet, but prices remain steady. Crude carbolic has shown signs of weakening; and some quantity has been offered at lower prices without success. Solvent and heavy naphthas are steady. Benzols are also weak; and it is difficult to arrange fresh contracts.

The average values during the week were: Tar, 17s. 9d. to 21s. 9d., *ex* works. Pitch, London, 35s. 6d. to 36s.; east coast, 35s. to 35s. 6d.; west coast, Manchester, 35s. 6d. to 36s. 6d., Liverpool, 35s. 6d. to 36s. 6d., Clyde, 35s. 6d. to 36s. 6d. Benzol, 90 per cent., casks included, London, 9d. to 9¼d.; North, 8¾d. to 9d.; 50-90 per cent., casks included, London, 9d. to 9¼d.; North, 8¾d. to 9d. Toluol, casks included, London, 9¾d.; North, 9¼d. to 9½d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 3¾d. to 3½d.; solvent naphtha, casks included, London, 11½d. to 1s.; North, 10½d. to 11d.; heavy naphtha, casks included, London, 1s. to 1s. 1½d.; North, 11d. to 11½d. Creosote, in bulk, London, 2¼d. to 2⅜d.; North, 1⅞d. to 2¼d. Heavy oils, in bulk, 2⅜d. to 2¾d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 7½d. to 1s. 8½d.; west coast, 1s. 7d. to 1s. 8d. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. to 1⅝d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market for this article has been decidedly flat during the past week, and, on the whole, prices are down 5s. to 7s. 6d. per ton. Actual Beckton is quoted to-day at £13 15s. Outside London makes have been quoted upon Beckton terms at £13 7s. 6d. In Hull, the price is £14 1s. 3d. to £14 2s. 6d.; Liverpool, £14 1s. 3d. to £14 2s. 6d.; Leith, £14 3s. 9d. to £14 5s.; and Middlesbrough, £14.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a stronger demand for coals in Northumberland and Durham, as often happens a week or so before a holiday. In the steam coal trade, best Northumbrians are a little higher at from 10s. 4½d. to 10s. 7½d. per ton f.o.b. Second-class steams are from 8s. 9d. to 9s. 3d., and steam smalls are steady at about 4s. 9d. to 6s. 3d., according to quality. Work is steady at the collieries; and the large output appears to be readily taken up. In the gas coal trade there is a better demand for export, though that for home use shows the decrease that is usual at this time of the year. Durham gas coals vary in price. The usual kinds are, according to quality, from 8s. 7d. to 9s. 5d. per ton, f.o.b.; while for "Wear specials," up to 10s. 6d. and 10s. 9d. is quoted. Few contracts have been decided since our last report. There have been, however, heavy sales of Durham coals for bunkering purposes, which lessen the gas coal offered in the market, and thus prices of some kinds of gas coals are stiffened, especially when the delivery is long forward. Some contracts for gas coals for London are now in close negotiation. Coke is quieter. Good gas coke is from 13s. 3d. to 13s. 9d. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

The market is still very quiet; the foreign trade not being at all healthy. The home consumption is good. Prices may now be quoted at: Ell, 8s. 9d. to 9s. 9d. per ton f.o.b. Glasgow; splint, 9s. 9d. to 10s.; and steam, 9s. to 9s. 6d. The shipments for the week amounted to 277,520 tons—an increase of 7546 tons upon the previous week, but a decrease of 52,009 tons upon the corresponding week last year. For the year to date, the total shipments have been 3,302,830 tons—a decrease upon the corresponding period of 86,868 tons.

No. 3.

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OUR last two advertisements have already brought us many enquiries for lists and particulars of our Water Heating apparatus. We expected it, and shall continue to anticipate the broadening of interest in our efforts to bring the hiring and sale of Water Heaters into more prominence. The essential features needed in any apparatus for Water Heating are:—

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Welsbach Company's Reorganization.

An extraordinary general meeting of the Welsbach Incandescent Gas Light Company, Limited, was held on Friday at Winchester House, E.C., for the purpose of submitting for confirmation the resolution passed providing for the sale of the undertaking to a new Company (see "JOURNAL" for March 7, p. 708). Lord Weardale, who presided, moved the confirmation of the resolution, and said that at the original meeting the agreement which this resolution would carry into effect was explained at considerable length. At the meeting of preference shareholders, it was necessary that the holders of two-thirds of the capital should acquiesce in the agreement; but they had not actually this proportion present, either in person or by proxy. By the middle of March, however, the holders of 457,736 preference shares out of a total of 600,000 had signified their acquiescence; and therefore the resolution became operative. Colonel Rankin proposed that, as the Company's financial year ended on March 31, the meeting might be adjourned for a week, so that the accounts dealing with the past twelve months' trading might be rendered, and the shareholders might have an opportunity of approving their representatives on the Board of the new Company. This, however, was negatived (after the Chairman had pointed out that if the meeting was adjourned the special resolution would fall through); and the motion was carried by sixteen votes to four. In the course of the discussion, the Chairman remarked that, under the agreement with the German Company, the trustees for the debenture holders (the United States Debenture Corporation) had the right to appoint two Directors; and since the last meeting, they had nominated Major Pringle and Mr. Crompton-Roberts. These names had been approved by the German Company, who were more interested than anyone else in the future success of the undertaking. Personally, he wished to say that he had nothing whatever to do with the promotion of the Welsbach Company. He was Chairman of the Advisory Committee who looked into the promotion, and did his best to save the Company from further loss. In quitting the Company that day, as the largest shareholder, and one who had lost more money in it than anybody else, he at least had his conscience clear that he had done his best for his brother shareholders.

Water Scheme for Westmorland Parishes.—The West Ward Rural District Council have adopted a water scheme for the supply of a large agricultural area of the Eden Valley, comprising thirteen parishes. The supply will be taken from two tarns in the Mardale part of the Lake District, above Lake Haweswater—Blea Water Tarn and Small Water Tarn—which will provide a minimum daily supply of 230,000 gallons. Mr. Joseph Graham, of Carlisle, was appointed to carry out the scheme, at a commission of 5 per cent. on the cost; his charges not to exceed £2000. The Council adopted agreements with the Earl of Lonsdale and other riparian owners, conveying water and other rights and privileges at an approximate cost of £400. The scheme is estimated to cost nearly £30,000.

Lectures to Gas-Fitters by Mr. Matt. Dunn.

Under the auspices of the Special Purposes Section of the North of England Gas Managers' Association, Mr. Matt. Dunn, of Stockton-on-Tees, has been delivering at St. John's School Room in his town, as well as the gas offices, South Shields, and in Rutherford College, Newcastle-on-Tyne, courses of free lectures to gas-fitters, lighting and meter inspectors, maintenance attendants, and apprentices, on the use of gas for lighting, heating, and industrial purposes. Each course consisted of four lectures, and they extended at intervals from Jan. 10 till last Tuesday. The first lecture was devoted to the application of gas for lighting purposes by the low-pressure system; and it appropriately began with some remarks on the composition of coal gas, the cause of luminosity, flame temperature, and the illuminating and calorific value of gas. Some remarks followed on burners and their efficiency, mantles, &c., and then Mr. Dunn dealt with the comparative values of gas and electricity for lighting purposes, and explained how to ascertain the amount of light required for various purposes. The lecture closed with some remarks on the reflecting power of wall-papers, ceilings, and coloured surfaces, the effect of globes on lighting efficiency, and the ventilating power of gas. The second lecture was devoted to high-pressure lighting; descriptions being given of the various systems, and the values of high-pressure gas and electric lighting being compared. Gas for domestic purposes was the subject of the third lecture; and in the course of it Mr. Dunn explained the construction and capacity of modern gas-fires, radiators, water-heaters, geysers, &c., giving comparative costs. The concluding lecture was on the industrial uses of gas; and Mr. Dunn showed how great is their variety—ranging from the driving of engines to the conditioning of cigars. In connection with the lectures, two leaflets were distributed furnishing rules for calculating the consumption and cost of electric energy required for interior illumination and for power purposes, and its comparison with gas; the lighting example being for 10,000 hours in each case, and the power example the cost per hour of working. These leaflets will be found of great value by inspectors and maintenance attendants, as by the help of the tabulated prices they will be able to answer on the spot any inquiry as to the comparative cost of gas and electricity. It only remains to say that the lectures were illustrated by practical demonstrations, and were very successful.

Bexhill Water and Gas Company.—At the ordinary general meeting of this Company last Tuesday, the accounts presented showed a balance of £4924 on the profit and loss account, and available for distribution. The Directors recommended a dividend for the half year ended Dec. 31 at the rate of 6 per cent. per annum on the £34,000 authorized by the Company's Acts of 1885 and 1892, and at the rate of £4 4s. per cent. per annum on the £114,570 authorized by the Act of 1896, the Order of 1901, and the Act of 1904, less income-tax. This, with provision for income-tax, would absorb £3426, and leave £1498 to be carried forward.

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Ticehurst and District Water and Gas Company.

The petition for the winding-up of this Company, which came before Mr. Justice Swinfen Eady on Tuesday last, was dismissed without costs—an agreement having been come to between the Company and the petitioners.

Compensation Claim by a "Dependant."

In a Workmen's Compensation Act case dealt with at the Manchester County Court last week, before Deputy-Judge Leresche, an unusual point was raised. While crossing a plank placed over a tank containing sulphate of ammonia, a gas-fitter named Ezra Higgs stumbled and fell into the tank, and was so badly injured that he died the same day. A married sister claimed £50 compensation from Messrs. Crossley Bros., her brother's employers, on the ground that at the time of his death she was partially dependent upon his earnings. According to the statement by Mr. Merriman, the Counsel for the applicant, Higgs resided with his sister, contributing to the household expenses 14s. weekly, which more than covered board and lodgings; and in addition he occasionally bought some clothes for the applicant's four children. The husband only earned 25s. a week; and this not being sufficient to keep the household going, the applicant was partly dependent on her brother. The total sum for which Messrs. Crossley were liable was more than £160. For the respondents, Mr. Adshead Elliott argued that there was no evidence of dependency or of a common fund; and he submitted that the relationship was solely that of a person who let lodgings and a lodger. He quoted a number of authorities in support of his argument that as a wife was "totally" dependent upon her husband, she could not at the same time be said to be "partially" dependent upon anyone else. Mr. Merriman said these points had been overruled by the House of Lords deciding that dependency was always a question of fact, and that a woman could be dependent upon the earnings of her sons as well as those of her husband. His Honour held that the applicant was partially dependent upon the payments made to her by her brother; and he awarded her 4s. a week for twelve months, with costs on "B" scale.

Proposal to Disfranchise Municipal Employees.—The *agenda* for the meeting of the Manchester City Council to-morrow contains a notice of motion by Mr. Burgess as follows: "That, in the opinion of this Council, municipal employees should not possess the municipal franchise, and that His Majesty's Government be respectfully requested to promote a Bill in Parliament for the purpose of disfranchising such employees." There are in Manchester about 20,000 municipal servants of all classes; and one of the chief arguments advanced in support of the motion is that their votes have a deciding influence in municipal elections in some wards, with the result that the men are really the masters of the situation, and can consequently select their own employers. Most of the Corporation officials regard Mr. Burgess's proposal with amusement.

Coventry Corporation and Gas-Fitting.

There was a short discussion at the meeting of the Coventry City Council last Tuesday with regard to the Gas Committee undertaking gas-fitting work, and thus, it was argued, entering into competition with ordinary tradesmen. Mr. Howells complained that the Gas Department were competing with gas-fitters, not only in regard to large undertakings, but also in the case of the supply and fixing of gas-fittings in small houses and factories. This he regarded as very improper for the Committee to do. They were cutting the prices, and keeping out the gas-fitters of the city. Alderman Batchelor, the Chairman of the Committee, in reply, said that while they had decided to give up small work, they considered it was very desirable that they should retain the privilege of imparting their advice and expert knowledge, acquired by long experience, to those who wished it. It was considered to be an advantage, both to the Gas Department and to consumers, that they should still keep in hand the fitting-up of large works, in order that they might be able to bring before the people the best methods of lighting by gas. They had no desire to enter into competition with small tradesmen, though it was practically certain that they were bound to do so in some cases. Mr. Howells asked if he could move that the minute of the Committee dealing with this matter be referred back, with instructions to the Committee not to compete with local gas-fitters, or would it require notice of motion. The Mayor (Alderman Lee) said to carry out the whole of what the speaker had suggested would require a notice of motion; but he could move the reference back without the instruction to the Committee. Mr. Howells said he would give notice. Mr. Nichols contended that under the present conditions no scope was allowed to the ordinary gas-fitter for rising to some large contract work; he was limited to small jobs entirely. He thought this form of municipal trading was altogether wrong.

Consolidated Water-Works of Rosario, Limited.—After making provision for bad and doubtful debts, the gross revenue of the Company for the past year amounted to £98,131, and working expenses to £39,546; leaving a balance of £58,584. After deducting debenture interest and other charges and interim dividends on the ordinary shares, tax free, and on the preference shares, and placing £4100 to the reserve fund (for redemption of capital), £7000 to the general reserve and contingency fund, and £5484 to the depreciation fund, £21,713 remains. The Directors recommend a dividend of 5 per cent. on the ordinary shares, making 8 per cent. for the year, tax free, and the placing of £2000 to the ordinary share dividend account; carrying forward £3013. They also recommend that the ordinary share dividend account should be closed, and that the amount at the credit of it should be distributed among the holders of the existing 25,000 ordinary shares as and when the funds of the Company permit. The consumption of water increased very largely last year, owing principally to the steady growth in the number of consumers. Further provision has consequently had to be made for increasing the capacity of the works.

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272.

Sales of Stocks and Shares.

At the Mart, Tokenhouse Yard, E.C., last Tuesday, Messrs. A. & W. Richards offered for sale a new issue of stock of the Uxbridge Gas Company by order of Directors, and stocks and shares in other undertakings. The first lots consisted of £12,000 of consolidated stock of the above-named Company, ranking for a standard dividend of 5 per cent., but entitled, in view of the present price of gas, to £6 2s. 6d. It fetched £120 to £121 10s. per £100. Some 4 per cent. perpetual debenture stock of the same Company was sold at par. A few fully-paid £10 original shares in the Leatherhead and District Water Company, carrying 10 per cent. dividend, fetched £24 15s. to £25 5s. each. A parcel of 5 per cent. capital stock of the Maidstone Gas Company, ranking for a standard dividend of 5 per cent. per annum, subject to the sliding-scale, and entitled to £7 5s. 6d. per cent., realized £149 10s. to £150 per £100. Some fully-paid £10 new ordinary shares in the Southend Water Company, ranking for a maximum dividend of 5 per cent., but carrying 4½ per cent., were sold at £10 5s. to £10 7s. 6d. each. A parcel of consolidated stock of the Sutton Gas Company, ranking for a standard dividend of 5 per cent., and carrying £5 15s. per cent., realized £120 per £100. On the same day, Messrs. Penney and Clark sold, at Southsea, 2000 fully-paid £5 shares in the Portsmouth Water Company. The whole of the shares, the dividend on which is limited to 5 per cent., were sold at prices ranging from £6 5s. to £6 10s. each; the premium realized being £2553 2s. 6d.

Antwerp Water-Works Company, Limited.—Remarkable progress continues with this Company; and, at the meeting last Wednesday, there was much satisfaction expressed with the report the Chairman (Mr. Easton Devonshire) had to lay before the prcprietors. During the year to Dec. 31 last, the income, from all sources, amounted to £84,845, as compared with £80,261 for 1909. After deducting working expenses, the cost of laying on services, and London expenses, there was a balance left of £59,733. Adding to this the undivided profit of £5106 brought forward from the previous account, and balance of interest on investments £108, there was a total credit of £64,949. Against this had been charged debenture interest and income-tax for 1910; the contribution to the reserve account of 5 per cent. on net profits, as provided by the Articles; the interim dividend of £16,500, at the rate of 11 per cent. per annum; the transfer to the sinking fund for redemption of debentures, £1900, and for that of the share capital, £6250; and the Directors' extra remuneration under the Articles of £2789. The sum of £28,824 was then left, out of which the Directors recommended that a balance dividend for the six months to Dec. 31 be paid at the rate of 13 per cent. per annum, free of income-tax, absorbing £19,500, and making a total dividend of 12 per cent. for the year; that £2730 be transferred to reserve account, to maintain the special contribution to that account at £10,000, and raising the total of the account to £38,406; and that the balance of £6593 be carried forward. The report and recommendations were adopted.

Devon Gas Association, Limited.

The fifth annual meeting of this Association was held last Tuesday, at Exeter—Mr. F. Templer Depree, J.P., in the chair. In moving the adoption of the report, the Chairman congratulated the shareholders on the satisfactory balance-sheet and prospects of the Company, and asked them to confirm the report and the payment of a dividend of 5 per cent. per annum. He said the North Tawton works had been reconstructed during the past year, and development of the Association generally had taken place in the several works. A great improvement had been shown in the sale of residual products; and a still greater one might be looked for in this direction in the near future. Mr. R. J. Rew (a Director), in seconding the motion, expressed great confidence in the future of the Association, which had now been placed on a satisfactory dividend-paying basis. The public lighting in four of the towns had been completely remodelled, and the latest type of incandescent burners adopted; and contracts with the public authorities had been obtained for terms of years. The number of consumers had steadily increased, and now totalled 750; the introduction of the slot installation system having made it possible for all inhabitants to utilize gas for lighting and cooking. The first portion of the present year showed an increased output and prosperity, and the future of the Association might now be looked forward to with confidence. Mr. J. A. Gray, the Gas Manager to the Teignmouth Urban District Council, in proposing the Directors' remuneration, expressed his pleasure at the satisfactory position of the undertaking, and said that, in comparison with previous years, he considered a steady improvement had been maintained.

Shareholders' Disqualifications.—At a recent meeting of the Devon County Council, an application was received from the Dawlish Urban District Council for an order dispensing with the prohibition with regard to voting in respect of certain members of the Council who are shareholders in the Dawlish Gas and Electric Light Companies. The Clerk explained that the Dawlish Council had eleven members, and all but three were disqualified through being shareholders in the two Companies. The Chairman said he did not suppose there was any objection to the removal of the disqualification; and it was agreed that the matter should be referred to the General Purposes Committee.

Sidmouth District Council and the Gas Company's Bill.—At a meeting of the Sidmouth Urban District Council last Friday, the Assistant-Clerk presented a report with reference to the petition of the Council against the Gas Company's Bill, which has been before a Committee of the House of Lords. He stated that, in consequence of the Council's opposition, the standard price of gas had been reduced from 4s. 10d. to 4s., which was 2d. below the present price. It was pointed out that this reduction would effect a saving of from £600 to £700 a year; and the Assistant-Clerk added that if they capitalized this saving, it would far outweigh the expense which the Council had incurred up to the present.

Llanelly Gas Company.—The accounts presented at the half-yearly meeting of this Company last Thursday showed that the revenue in the six months ended Dec. 31 was £10,788, and the expenditure £7828; showing a gross profit of £2960. The amount available for distribution was £2851; and the Directors recommended the payment of the maximum dividend on all classes of shares for the half year. This would absorb £1783, and leave £1068 to be carried forward. They reported that the sales of gas and the number of consumers continued to increase very satisfactorily.

Electric Light Failure at a Reception of the American President.—According to an extract from an Eastern paper reproduced in our American contemporary the "Gas Industry" for last month, there was a complete failure of the electric light at the reception given by the Secretary of the Treasury and Mrs. MacVeagh to the President of America and Mrs. Taft, at their house in Washington, on the 17th of February. The entire drawing-room floor was in darkness, except where a few antique lamps, intended more for ornament than utility, shed a faint glow over quite limited spaces. The Electric Light Company managed to restore the defect in the wires after four hours, and furnished light for a one o'clock supper. The hosts, at the top of a broad stairway, welcomed the President and Mrs. Taft by the rays coming upward from the lower hall. Candles in the music-room enabled the artist at the huge organ to continue his piece; but in the ball-room the dancing naturally ceased. A resourceful lady living opposite gathered up candles from her own house and those of all the neighbours in an incredibly short time, and the dance went on with bottles doing duty as candelabra, and kitchen lamps giving light for the musicians. It is stated that Mr. MacVeagh is having his house piped for gas.

Gas v. Oil at Bristol.—A striking instance of the advantage of gas over oil for street lighting was recently provided in Bristol. It was found that certain petroleum lamps of the pattern in use in one district cost £3 18s. 4d. each per annum. They had an illuminating power of 25 candles. The cost per annum of a No. 3 incandescent gas-burner of 75-candle power is £2 0s. 6d. There are 116 oil-lamps at present in the district, so that their annual cost works out at £454. The cost for the same number with gas would be £234—there being thus a saving of £220. The Gas Company were approached, and stated that they were prepared to lay mains to supply the lamps under consideration on terms involving an outlay of £2516. The sum of £218 is equivalent to the amount required to pay off this capital sum by sinking fund and interest in fifteen years at 3½ per cent. The Sanitary Committee of the City Council, who had the matter in hand, also had an estimate from the Electrical Department. The figure in this case for extending the mains and fitting up 116 lamps of 64-candle power was £9160. The question arose as to whether the work of laying the gas-mains could not be carried out cheaper by the Corporation; and a decision on the matter was deferred until this had been ascertained, together with other details.

Lincoln Water Supply.—The Mayor of Lincoln (Mr. C. H. Newsum), when replying to a toast at the dinner of the United Kingdom Commercial Travellers' Association at Lincoln a few days ago, referred to the Elkesley water scheme. He stated that he had recently paid a visit to the reservoir, the water-tower, and the pumping-station, and the more he saw of the work the more he was convinced that the citizens would get the supply of water within the next five or six months. When the water did come, the people of Lincoln would have a supply which would be second to none in the kingdom.

Water Supply for Baku.—According to the Engineering Supplement to "The Times," preparations for starting work on the water supply for Baku are being actively pursued, according to plans which have been prepared by Sir William Lindley, the Water Engineer to the Municipality of Frankfort-on-the-Main. The contract, which has been placed with Messrs. Griffiths and Co., Limited, involves the construction of a conduit to bring from 6 to 10 million gallons of water per 24 hours from a range of mountains situated 120 miles north of Baku; the actual source being a group of 13 artesian wells, each of which will be 200 feet deep and about 32 inches diameter. The actual conduit will be pear-shaped—measuring 56 in. by 68 in., and about 105 miles long. It will be laid in concrete, on the "cut and cover" method, in a trench of an average depth of 14 ft. 6 in. A pumping-station will be built at Sumgait, where the main conduit terminates; and from the station there will be a cast-iron rising main, 32 inches diameter and 11 miles long. The water will then pass through a tunnel 2656 feet long, and flow by gravity to a service reservoir. The value of Messrs. Griffith's contract is £1,100,000; and it is expected that the work will occupy, approximately, three years. It will be superintended for them by Mr. R. St. George Moore.

Gas Exhibition at Ardrossan.—Under the auspices of the Ardrossan Town Council, an exhibition of gas cookers, fires, and lighting appliances was held in the Assembly Hall in that town from Monday to Friday last week. The exhibits were furnished by Messrs. R. & A. Main, Limited, and by Messrs. Falk, Stadelmann, and Co., Limited; and an excellent display was made. On the evening of the opening day, the Corporation Gas Manager (Mr. J. D. Keillor) gave to a large audience a most informative lecture, illustrated by limelight views, on the history, manufacture, and uses of coal gas. Cooking demonstrations were given by Miss E. M. Dods, late Principal of the Dundee School of Cookery; and on Wednesday she afforded a striking proof of the superiority of gas for cooking purposes by preparing, in the presence of several hundred ladies, a six-course dinner at a cost for fuel of only 1¼d. After the demonstration, Mr. M'Ewan, the representative of Messrs. Main, commented on the unquestionable proof which had been given of the superiority of gas for culinary purposes, and pointed out its economy and advantages for heating rooms. During the exhibition, orders for 250 cookers, 30 gas-fires, and a number of other appliances were booked; and as the town has still to be canvassed, these numbers will no doubt be considerably increased.

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Additional Capital for the North Pembrokeshire Water and Gas Company.—An extraordinary general meeting of this Company was held at Salisbury House, E.C., last Tuesday, for the purpose of considering an application made to the Board of Trade for a Provisional Order empowering them to vary the class of the unissued capital of the Company by the creation of preference shares, and for other purposes. Mr. R. Barnes, who presided, explained that there was unissued capital to the amount of £11,000, and the application had to be made before they could get it taken up. The Directors did not wish to issue the whole of the £11,000 in preference shares, as £2000 or £3000 would be ample; and if the application was successful, the shareholders would be called together to ask if they agreed with the sum the Board suggested. The application to the Board of Trade was sanctioned.

Exmouth Gas Company.—The annual general meeting of this Company was held last Friday—Mr. L. D. Thomas presiding, in the unavoidable absence of the Rev. C. R. Carr, the Chairman. The Directors reported that the business of the Company continued to advance satisfactorily; the sales of gas during the past year having increased by upwards of 2 million cubic feet. By the Company's Act of last session, authority had been obtained to raise additional capital and extend the area of supply. The Directors recommended the payment of the usual dividends of 10 and 7 per cent., free of income-tax. In moving the adoption of the report, the Chairman referred to the advantages gained under the new Act by the inclusion of the parish of Lympstone in the Company's area, and by the consolidation of the three classes of capital into one ordinary stock. With regard to the working last year, owing to the reduced price of coal, £5915 had been expended on it, against £6206 in 1909; and there had been savings in other departments. The total receipts were £12,373, compared with £12,000 before. The report was adopted and the dividends recommended were declared.

Charge for Water in Bradford Out-Districts.—The Water Engineer of the Bradford Corporation (Mr. James Watson, M.Inst.C.E.) has prepared a report on the subject of an application recently made by the townships of Pudsey, Farsley, and Calverley, for a reduction in the charges for water supplied to them by the Corporation. The application was refused by the Watch Committee. Mr. Watson says that last year the Pudsey Corporation paid Bradford £2563 for water, and charged the ratepayers £1825 in addition for its distribution. The cost of the water was therefore high by reason of the Pudsey Corporation carrying on at a large cost a small and only partial water undertaking, the expenses being altogether out of proportion to those at Bradford. At Farsley, while the average paid to the Bradford Corporation for water was £1118 per annum, the charge to the ratepayers was £1650. At Calverley, the water charges, were loaded for purposes which had nothing to do with water. Mr. Watson recommends that water be supplied to the townships by the Bradford Corporation in a manner similar to that by which Liversedge is supplied; the Corporation dealing with consumers direct, instead of supplying water in bulk to the authorities.

London County Council and the Metropolitan Water Supply.—At the meeting of the London County Council last Tuesday, the Parliamentary Committee presented a long report on the Metropolitan Water Board (New Works) Bill and the Thames Conservancy Bill, both of which are now, as recorded elsewhere, under consideration by a Joint Committee of the Lords and Commons. The Committee recommended that no action should be taken on the Bills. Mr. A. L. Leon moved, as an amendment, that petitions should be presented against them. Mr. Freeman Barrett, the Chairman of the Public Health Committee, seconded the amendment, on the ground that sufficient attention had not been paid to the possibility that the water taken into the proposed new reservoirs might be contaminated with sewage from the sewage farms of Windsor Castle and town. The amendment was defeated by 53 votes to 50; and the recommendation was then agreed to. It was further decided that the attention of the Water Board should be drawn to the possibility of the contamination of the water by the sewage from Windsor.

Quality of Holyhead Water.—At the half-yearly meeting of the Holyhead Water Company last Tuesday, the Chairman (Mr. J. H. Burton, J.P.) said the most important item in the statement of accounts submitted was the sum spent on the examination of the water. As some of the shareholders were already aware, this expenditure was brought about entirely by alarmist reports concerning the quality of the water derived from one source; and the Directors deemed it advisable to secure the services of Dr. Thresh and Dr. Beale. These gentlemen made a personal visit to Holyhead and took samples from every source of the Company's supply, and examined them chemically and bacteriologically. Their reports and analyses proved the rumours to be without foundation. The incident, however, involved the Company in an expenditure of more than £60. He expressed sympathy with the shareholders because no dividend would be declared; but the considerable portion of the addition to the expenditure was a result of the attitude taken up by the Urban District Council, and the alarming reports which had been circulated in reference to the quality of the water supply. He moved the adoption of the recommendation of the Directors, to the effect that no dividend should be declared, and that the balance should be carried forward. After some discussion, the recommendation was agreed to. In his annual report, Dr. Clay, the Medical Officer of Health to the District Council, states that during the year the quality of the water was not by any means good. He adds: "Frequent representations have been made to the Water-Works Company, with the result that Drs. Thresh and Beale were engaged on their behalf to examine the whole system, and specially report on the water supply of the district. As no copy of the report of these Analysts has been received by the Council, in spite of a request being made to the Company, I am ignorant of the nature of the report of the experts. There has, however, following upon the representations made, been a certain amount of improvement in the quality of the water; the last samples sent not showing any indication of recent material contamination. But there is still room for improvement, as there is always an excessive amount of vegetable matter present."

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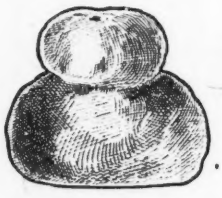

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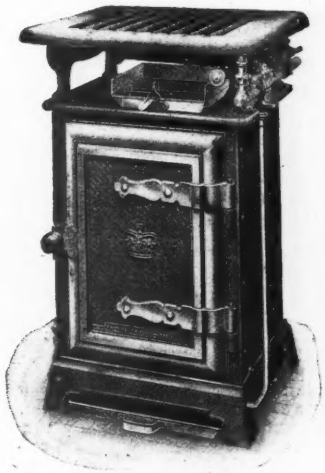

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Gas Charges in Salford.—The fourth of a series of ratepayers' meetings in Salford and the district, to protest against the present charges for gas, was held last Friday night in the Co-operative Hall, Pendleton. A resolution was passed calling upon the Mayor to convene a town's meeting to discuss the whole matter.

Budleigh Salterton Gas Company.—At the annual general meeting of this Company last Wednesday, the Directors reported a profit of £928; and after paying the dividend on the preference shares and the interest on the debentures, there was a disposable balance of £622. They had placed £400 to the reserve fund, £200 of which had been transferred to the capital account; and they recommended the payment of a dividend of 3 per cent., less income-tax, as before—leaving £137 to be carried forward. The Chairman (Mr. A. R. S. Perkins), in moving the adoption of the report, said the Company had had a very satisfactory year's working. They were exceedingly well pleased with their present Manager, who was energetic; and the increase in the sale of fittings, which was his particular work, was £141. During the year there had been 500,000 cubic feet more gas consumed compared with 1909. Mr. J. C. Palmer seconded the motion. Mr. W. A. Padfield thought the Directors should pay more dividend on the ordinary shares. The Chairman said they would like to do so; but the heavy expenditure they had in view prevented this being done. They hoped to be able next year to pay 4 per cent. The report was adopted with one dissentient (Mr. Padfield).

The Stokesley Gas Company, Limited, has been registered as a private undertaking, with a capital of £3000, in £10 shares, to take over the business of the Stokesley Gas Company.

The Directors of the Bombay Gas Company, Limited, recommend a dividend at the rate of 4 per cent. for the half year ended Dec. 31; making, with the interim dividend, 7 per cent. for the year 1910.

The Borough of Shoreditch have accepted the Wholesale Fittings Company's tender for the supply of glassware for the ensuing year; and their tenders for sundry incandescent goods have been secured from the Great Eastern Railway.

The seventh annual meeting of Willey and Co., Limited, of Exeter, was held last Tuesday. The Directors reported a successful year's working; and it was resolved that the usual dividend of 8 per cent. per annum, and also a bonus of 1 per cent. per annum, be paid on the ordinary shares.

The concession recently made to slot-meter users by the Manchester Gas Committee—viz., 33 in place of 30 cubic feet for 1d. to consumers within the city, and 28 instead of 25 cubic feet to consumers outside the city area—represents a loss of revenue to the Gas Department of about £7000 per annum.

According to a report by the United States Consul at Yokohama, several gas companies in Japan make naphthalene during the winter, most of which is used by the Military Department as a disinfectant. Naphthalene is largely imported from the United States; the wholesale price varying from $3 to $3.50 per cwt.

The Highways Committee of the Westminster City Council have accepted the following quotation from the Gaslight and Coke Company for improved lighting at the Grosvenor Road Wharf: Supplying and fixing two 300-candle power lamps on the jetty, £7 10s. per lamp; annual charge for lighting, maintenence, &c., £6 10s. per lamp.

A Special Committee of the Salford Town Council recommend that employees of the Corporation shall be granted holidays, with pay, on Coronation Day and the Bank Holiday following it; and that any who are required to work on these days—for example, those engaged at the gas-works—shall be paid double rate of wages for the time worked.

At the annual general meeting of the shareholders of Gibbons Bros., Limited, of Dudley, held on the 27th ult., Mr. H. V. Stanton, the Secretary of the Company, who was elected a Director in December last, had his appointment duly confirmed. At the same time, Mr. C. J. M'Ewen (late of the Liverpool United Gaslight Company), who has joined the Company, was also elected a Director.

Mr. J. T. Saunders presided on Friday at the annual meeting of the New Inverted Incandescent Gas-Lamp Company, Limited, and, in moving the adoption of the report and accounts, noticed last week (p. 949), said the business had developed considerably during the past year. The prospects of the Company in the direction of public lighting were so satisfactory that it promised to become an important branch of their undertaking. Their works at Birmingham had been a source of profit, as they were able to produce at first cost the articles in which they dealt—viz., fittings, burners, &c. The report was adopted.

The Directors of the Tarapaca Water-Works Company, Limited, in their report for the past year, state that the net profit amounted to £51,864, which, added to the balance on Jan. 1, 1910 (£10,806), and allowing £1464 for income-tax, makes a total of £61,205 to the credit of the profit and loss account. An interim dividend was paid on Oct. 1 last at the rate of 8 per cent. per annum, absorbing £12,800; leaving a sum of £48,405 to be dealt with. The Directors recommend the payment of a final dividend of 4 per cent., making 8 per cent. for the year, and the placing of £25,000 to the reserve fund. This will leave a balance of £10,605 to be carried forward.

Some weeks ago, the Haringey Burgesses' Association expressed a wish to visit the works of the Hornsey Gas Company; and by the Directors' permission a large party was recently received by the Engineer and General Manager (Mr. J. W. Buckley, M.Inst.C.E.), and conducted round by him and his assistants. The whole of the science and practice of the manufacture of gas was fully explained. At the close of the inspection, a hearty vote of thanks was accorded to Mr. Buckley and his staff for the instruction given to the visitors. Mr. Buckley, in reply, said he had been only too happy to have the opportunity of meeting so large a body of consumers, and of showing and explaining to them the Company's methods of gas manufacture. At the request of the Chairman of the Association, Mr. Buckley has consented to give a lecture on "Gas and its Manufacture" at a meeting of the members.

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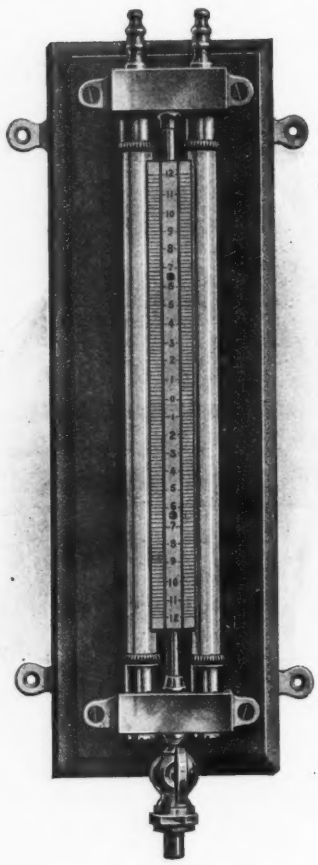

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We have received from the Carron Company a copy of their new season's gas-cooker booklet, which furnishes in a compact form illustrated particulars of a large assortment of the Company's cookers, grillers, boilers, &c. The descriptive matter is preceded by some remarks on the advantages of cooking by gas, and by directions for using the Carron cookers.

The freehold gas and water works of the Meldreth and Melbourn District Gas and Water Company, Limited, were not sold at the auction last Tuesday—no sufficient bid being forthcoming. The Auctioneers, Messrs. A. & W. Richards, are, however, we understand, prepared to consider any offer submitted to them for purchase by private treaty. It is said that £750 was refused for the works.

Referring to Major Pringle's recommendation, in his report on the Hawes Junction accident, noticed elsewhere, that electricity should be used instead of gas for the lighting of railway carriages, Lord Claud Hamilton, M.P., the Chairman of the Great Eastern Railway Company, remarked, in the course of an interview with a representative of the "Daily Mail," that gas is often more popular with the public than electricity, as, with the new burners, giving a pure, steady light, "they find it more agreeable for the eyes than any other illuminant."

We have received from Messrs. John Wright and Co., of Birmingham, a copy of a new and comprehensive list of their cooking and water-heating apparatus for hotels, hydros, restaurants, &c., and feel that it is no more than bare justice to compliment the firm (who, in their turn, have no doubt likewise complimented the printers) on the excellent appearance of the catalogue, which gives particulars and illustrations of much new and useful apparatus that will appeal to all gas authorities. There are no less than 120 pages of letterpress and blocks.

Attention has been called to a page advertisement appearing in the "Kent and Sussex Courier," in which the Tunbridge Wells Gas Company point out "What gas at 2s. 6d. per 1000 cubic feet (or 3d. per 100 cubic feet) means to the householder." The case presented for gas is, of course, a strong one; and, in addition to this, the page contains a number of advertisements of firms whose announcements are regularly to be seen in the "JOURNAL." Pages arranged on similar lines are, it may be remarked, being inserted by the Gaslight and Coke Company in the "Pall Mall Gazette" and other papers.

The thirteenth ordinary general meeting of Messrs. C. & W. Walker, Limited, was held in Birmingham last Thursday, under the presidency of Mr. J. F. Wright. Moving the adoption of the report, noticed in the "JOURNAL" for the 21st ult. (p. 871), the Chairman said the profit for the past year amounted to £7178, after providing for all charges, and writing off an ample sum for depreciation to buildings and plant. This enabled the Directors to pay the usual dividend of 10 per cent. on the ordinary shares and place another £2000 to the reserve. At the same time they carried forward the substantial sum of £7376. This was by no means an unsatisfactory position, bearing in mind that the whole of the goodwill, which originally amounted to £15,000, had been written off, debentures amounting to £20,000 had been paid off, and a reserve fund of £27,000 had been established. As to the prospects for the future, it was too early to say anything definite. But they had a fair number of contracts in hand; while from inquiries they had received, and from work they knew was coming out later, they expected the turnover would not be less than that of last year. It might be interesting for the shareholders to know that they had completed in Canada the largest gasholder in the world; the largest gasholder in New Zealand was in course of construction; and in South America what would be the biggest spiral-guided gasholder in the world was being erected. In the past year the tonnage sent out from the works was the largest in the history of the Company—more than 20 per cent. above that of the previous year. The report was adopted; and the dividends recommended by the Directors were approved.

APPLICATIONS FOR LETTERS PATENT.

6924.—STETTINER CHAMOTTE-FABRIK AKTIEN-GES. VORMALS DIDIER. "Coke-ovens, retort-furnaces, and the like." March 20.
6925.—BICKERTON, H. L., "Utilization of furnace or burner gases for power and heating." March 20.
6965.—VALITE, LTD., and DUVAL, V. D., "Acetylene generators." March 20.
7092.—JOHNSON AND PHILLIPS, LTD., and BROCKIE, J., "Suspending, lowering, and hoisting lamps." March 21.
7109.—EDWARDS, J. E., "Bye-pass flat-flame burners." March 22.
7115.—BROOKE, F. H., "Silica fire-bricks." March 22.
7135.—CLAYTON, SON, AND CO., LTD., and PICKERING, J. R., "Luteless purifiers." March 22.
7182.—SMITH, W., "Fuel." March 22.
7210.—DAVIS, H. N., and TWIGG, W. R., "Thermostatic valve." March 22.
7250.—CROCKATT, W., "Removing incrustation from pipes." March 23.
7272-3-4.—SMITH, E. W., "Fuel." March 23.
7276.—STEWART, J. G., "Liquid meters." March 23.
7280.—LEVY, L. A., "Estimating and recording the percentage of carbon and monoxide in gaseous mixtures." March 23.
7305.—SMITH, E. W., and CHURCH, S., "Prepayment meters." March 23.
7313.—ANDERSON, D., "Gas-lamps." March 23.
7330.—KOLLER, K., "Producing gas from brown coal, lignite, and the like." March 23.
7341.—FAIRLESS, G. P., and PRENTICE, H. B., "Carrier for globes." March 24.
7354.—SUTCLIFFE, J. H., and SCATCHARD, A., "Carburetting air or gas." March 24.
7424.—ZECHNALL, L., "Shades for gas-lamps." March 24.
7515.—WORSFOLD, F. J., "Inverted lamps." March 25.
7547.—ALDRIDGE, J. G. W., "Retort charging." March 25.

'CROWNED WITH SUCCESS'

THE Cooker

For 1911 is the

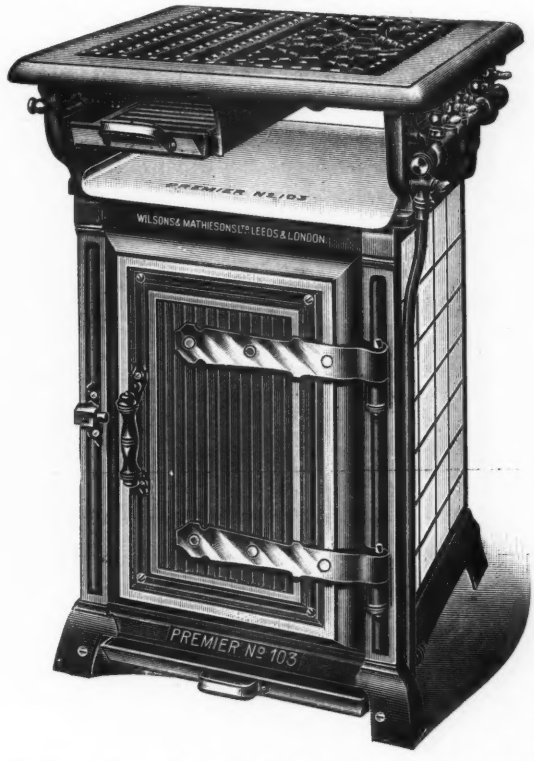
WILSON

"PREMIER."

(*Made in THREE SIZES.*)

HIGHEST EFFICIENCY.

GREATEST VALUE.



STRIKING ALL-ROUND SUPERIORITY.

Independent Tests continue to prove the all-round superiority of the "PREMIER" which has the

Most Efficient GRILL,
Most Efficient OVEN,
Most Efficient TOP BURNERS
("Tangent Star" shape).

Now supplied with REVERSIBLE HINGED HOT-PLATE and UNBREAKABLE CAST-MALLEABLE GRIDS.

Send for Sample Stove from the MAKERS

WILSONS & MATHIESONS, LTD.,

Carlton Works, ARMLEY, LEEDS.

London Office and Show-Rooms: 76, QUEEN ST., CHEAPSIDE, E.C.

TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending April 1. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article.	Basis.	London.	North-East Coast.	East Coast, Yorks.	West Coast.		Glasgow.
					Liverpool.	Manchester.	
Tar crude	per ton	—	18/9 21/6	18/9 22/3	18/6 21/-	18/6 21/-	—
Pitch	,,	37/-	35/6	36/-	36/-	35/- 35/6	35/6
Benzol, 90%	per gallon	-/10	-/9	-/9	-/9	-/9	-/9
Benzol, 50-90%	,,	-/10½	-/9¼	-/9¼	-/8⅝	-/8⅝	—
Toluol, 90%	,,	—	-/9¼	-/10	-/10	-/10	-/10
Crude naphtha, 30%	,,	—	-/3⅜	-/4	-/3⅝	-/3⅝	—
Light oil, 50%	,,	—	-/3⅜	-/3⅜ -/4	-/3⅜	-/3⅜	—
Solvent naphtha, 90-160	,,	1/-	-/10½ -/11	-/10	-/9½	-/10⅜	-/11
Heavy naphtha, 90-190	,,	—	-/11	-/11½	-/10⅜	-/11¼	-/11
Creosote in bulk	,,	-/2½ -/2⅝	-/2 -/2¼	-/2	-/2 -/2¼	-/2¼	-/1⅞
Heavy oils	,,	-/3¼	-/2⅛ -/3	-/2¼	-/2⅜	-/2⅜	-/2⅜
Carbolic Acid, 60's	,,	—	1/8 1/9	1/8½	1/7½	1/7⅜	1/9
Naphthalene, crude drained salts	per ton	—	42/6 45/-	40/- 42/6	42/6 47/6	45/- 47/6	—
,, pressed	,,	—	60/-	63/-	57/6 60/-	60/- 72/6	—
,, whizzed	,,	—	—	—	70/- 72/6	60/- 75/-	63/-
Anthracene	per unit	-/2	-/1⅜	-/1½	-/1¼	-/1¼	—

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

DRAUGHTSMAN (Temporary). No. 5374.
GAS METERS INSPECTOR. Corporation of London. Applications by April 13.
JUNIOR CLERK. North Ormesby Gas Company.
LEAKAGE DETECTOR. No. 5376.
MAN EXPERIENCED IN HIGH PRESSURE GAS HEATED APPLIANCES. No. 5371.
REPRESENTATIVE. No. 5377.
TRAVELLER. No. 5361.
WORKING FOREMAN (Brass shop). G. Wilson, Coventry.

Situations, &c., Wanted.

SULPHATE PLANT REPAIRER, &c. Davies, Shepherd's Bush.

Pupil Wanted.

No. 5373.

Plant, &c. (Second-Hand), For Sale.

ENGINE AND EXHAUSTER, &c. Aberystwyth Gas Company.
HIGH PRESSURE LIGHTING PLANT. Hereford Gas Works.
PUMPS. W. Johnson, Jun., New Hythe.
SLOT-COOKERS. No. 5375.
STATION METER. Oldbury Gas Department.
WATER WHEEL, BEAM ENGINE, &c. W. Johnson, jun., New Hythe.

Stocks and Shares.

ANNFIELD PLAIN AND DISTRICT GAS COMPANY. By Tender. April 11.
ASCOT DISTRICT GAS AND ELECTRICITY COMPANY. By Auction. April 25.
SOUTH ESSEX WATER COMPANY. By Auction. April 25.
WHITCHURCH AND DISTRICT GAS COMPANY. By Auction. April 25.

TENDERS FOR

Coal and Cannel.

ISLE OF THANET GASLIGHT COMPANY. Tenders by April 19.
SHREWSBURY GASLIGHT COMPANY. Tenders by April 21.
WARRINGTON GAS COMMITTEE. Tenders by April 15.

Coal Elevator and Gas-Engine.

STOKE-ON-TRENT GAS DEPARTMENT. Tenders by April 19.

Fire Clay Goods.

COALVILLE GAS DEPARTMENT. Tenders by April 18.
LOUGHBOROUGH GAS DEPARTMENT.

Gasholder and Tank.

SHERBORNE GAS COMPANY. Tenders by April 21.

Purifiers, &c.

COALVILLE GAS DEPARMENT. Tenders by April 18.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 17.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
1,551,868	Stk.	Oct. 14	5	Alliance & Dublin Ord.	84–87	+1	5 14 11	4,940,000	Stk.	Nov. 11	9	Imperial Continental	191–193	..	4 13 3
374,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	96–98	..	4 1 8	1,235,000	Stk.	Feb. 10	3½	Do. 3½ p.c. Deb. Red.	92–94	..	3 14 6
300,000	5	Oct. 28	7	Bombay, Ltd.	6½–7	..	5 0 0	200,242	Stk.	Mar. 10	6	Lea Bridge Ord. 5 p.c.	119–121	..	4 19 2
40,000	5	,,	7	Do. New, £4 paid	5¼–5⅞	+⅛	4 17 5	561,000	Stk.	Feb. 24	10	Liverpool United A.	214–216	..	4 12 7
50,000	10	Feb. 24	15	Bourne-) 10 p.c.	28–29	..	5 3 5	718,100	,,	,,	7	Do. B.	161½–163½	..	4 5 8
311,810	10	,,	7	mouth Gas) B 7 p.c.	16–16½	..	4 4 10	306,083	,,	Dec. 30	4	Do. Deb. Stk.	102–104½	+1	3 16 7
75,000	10	,,	6	and Water) Pref. 6 p.c.	14½–15	..	4 0 0	75,000	5	Dec. 15	6	Malta & Mediterranean	4⅜–5	..	6 0 0
380,000	Stk.	,,	12½	Brentford Consolidated	252–255	..	4 18 1	560,000	100	Apl. 1	5	Met. of) 5 p.c. Deb.	100–102	..	4 18 0
330,000	,,	,,	9½	Do. New	197–200	..	4 16 0	250,000	100	,,	4½	Melbourne) 4½ p.c. Deb.	100–102	..	4 8 3
50,000	,,	,,	5	Do. 5 p.c. Pref.	122–124	..	4 0 8	541,920	20	Nov. 11	3½	Monte Video, Ltd.	13–13¼	+¼	5 3 8
206,250	,,	Dec. 15	4	Do. 4 p.c. Deb.	98–100	..	4 0 0	1,775,892	Stk.	Feb. 24	4⅛	Newc'tle&G'tesh'd Con.	100½–101½	..	4 6 2
220,000	Stk.	Mar. 10	11	Brighton & Hove Orig.	215–218	..	5 0 11	529,705	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	89–90	..	3 17 9
246,320	,,	,,	8	Do. A Ord. Stk.	155–158	..	5 1 3	55,940	10	Mar. 10	7	North Middlesex 7 p.c.	14½–15½	..	4 10 4
460,000	20	Sept. 29	10⅝	British	44½–45½	..	4 13 6	300,000	Stk.	Nov. 30	8	Oriental, Ltd.	139–141	..	5 13 6
120,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. Stk.	96–98	..	4 1 8	60,000	5	Sept. 15	8	Ottoman, Ltd.	7–7½	..	5 6 8
109,000	,,	Feb. 10	6	Bromley, A 5 p.c.	116–118	..	5 1 8	31,800	53	Feb. 24	13	Portsea Island A	135–140	+6½	4 18 4
165,700	,,	,,	4½	Do. B 3½ p.c.	87–89	..	5 1 2	60,000	50	,,	13	Do. B	125–130	+3½	5 0 0
82,278	,,	,,	5½	Do. C 5 p.c.	106–108	..	5 1 10	100,000	50	,,	12	Do. C	120–125	+5½	4 16 0
55,000	,,	Dec. 30	3½	Do. 3½ p.c. Deb.	84–86	..	4 1 5	114,800	50	,,	10	Do. D and E.	102–105	+1½	4 15 3
250,000	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	96–98	..	4 1 8	398,490	5	Oct. 28	7	Primitiva Ord.	7⅞–8	..	4 7 6
100,000	10	—	—	Cape Town & Dis., Ltd.	3¾–4¼	..	—	796,980	5	Dec. 30	5	Do. 5 p.c. Pref.	5¼–5½	..	4 10 11
100,000	10	—	—	Do. 4½ p.c. Pref.	6–6½	..	—	488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	97–99	..	4 0 10
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	—	..	—	312,650	Stk.	Dec. 30	4	River Plate 4 p.c. Deb.	96–98	..	4 1 8
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	88–90	..	5 0 0	250,000	10	Mar. 24	9	San Paulo, Ltd.	15½–16*	..	5 12 6
157,150	Stk.	Feb. 24	5	Chester 5 p.c. Ord.	109–111	..	4 10 1	115,000	10	,,	6	Do. 6 p.c. Pref.	11½–12*	..	5 0 0
1,513,280	Stk.	,,	5/9/4	Commercial 4 p.c. Stk.	113–116	..	4 14 3	125,000	50	Jan. 3	5	Do. 5 p.c. Deb.	50–51	..	4 18 0
560,000	,,	,,	5½	Do. 3½ p.c. do.	108–110	..	4 16 11	135,000	Stk.	Mar. 24	10	Sheffield A	232–234½	+2	4 5 6
475,000	,,	Dec. 15	3	Do. 3 p.c. Deb. Stk.	77–79	..	3 15 11	209,984	,,	,,	10	Do. B	232–234½	+2	4 5 6
800,000	Stk.	,,	4	Continental Union, Ltd.	95–97	..	4 2 6	523,500	,,	,,	10	Do. C	232–234½	+2	4 5 6
200,000	,,	,,	7	Do. 7 p.c. Pref.	136–138	..	5 1 5	70,000	10	Oct. 14	6	South African	10½–11	..	5 9 1
492,270	Stk.	—	5½	Derby Con. Stk.	122–124	..	4 8 9	6,429,895	Stk.	Feb. 10	5/9/4	South Met., 4 p.c. Ord.	119–121	..	4 10 3
55,000	,,	—	4	Do. Deb. Stk.	104–105	..	3 16 2	1,895,445	,,	Jan. 13	3	Do. 3 p.c. Deb.	79–81	..	3 14 1
148,995	,,	Oct. 14	5	East Hull 5 p.c. Ord.	103–105	..	4 15 3	209,820	Stk.	Mar. 10	8	South Shields Con. Stk.	153–155	..	5 3 3
840,150	10	Jan. 27	10	European, Ltd.	19½–20½	..	4 17 7	605,000	Stk.	Feb. 24	5⅜	S'th Suburb'n Ord. 5 p.c.	119–121	+1	4 13 6
16,179,445	Stk.	Feb. 24	4⅜	Gas-) 4 p.c. Ord.	105½–106½	..	4 7 7	60,000	,,	,,	5	Do. 5 p.c. Pref.	118–120	..	4 3 4
2,600,000	,,	,,	3½	light) 3½ p.c. max.	85–87	..	4 0 6	117,058	,,	Jan. 13	5	Do. 5 p.c. Deb. Stk.	122–124	..	4 0 8
4,062,235	,,	,,	4	and) 4 p.c. Con. Pref.	101–103	..	3 17 8	502,310	Stk.	Nov. 11	5	Southampton Ord.	111–113	..	4 8 6
4,531,705	,,	Dec. 15	3	Coke) 3 p.c. Con. Deb.	79–81	..	3 14 1	120,000	Stk.	Feb. 10	7	Tottenham) A 5 p.c.	141–143	..	4 17 11
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.	92–94	..	5 6 5	483,940	,,	,,	5½	and) B 3½ p.c.	115–117	..	4 14 0
82,500	,,	,,	6½	Do. do. 5 p.c.	—	..	—	149,470	,,	Dec. 15	4	Edmonton) 4 p.c. Deb.	98–100	..	4 0 0
70,000	10	Oct. 14	11	Hongkong & China, Ltd.	17⅛–18	..	6 2 3	182,380	10	Dec. 30	8	Tuscan, Ltd.	9–9½	..	8 8 6
131,000	Stk.	Mar. 10	7⅜	Ilford A and C	143–146	..	5 1 0	149,900	10	Jan. 3	5	Do. 5 p.c. Deb. Red.	98–100	..	5 0 0
65,780	,,	,,	5¾	Do. B	113–115	..	5 2 2	236,476	Stk.	Feb. 24	5	Tynemouth, 5 p.c. max.	112–113	..	4 8 6
65,500	,,	Dec. 30	4	Do. 4 p.c. Deb.	96–98	..	4 1 8	255,696	Stk.	Feb. 24	6½	Wands-) B 3½ p.c.	141–143	..	4 14 5
								85,766	,,	Dec. 30	3	worth) 3 p.c. Deb. Stk.	73–75	..	4 0 0

Prices marked * are "Ex. div."